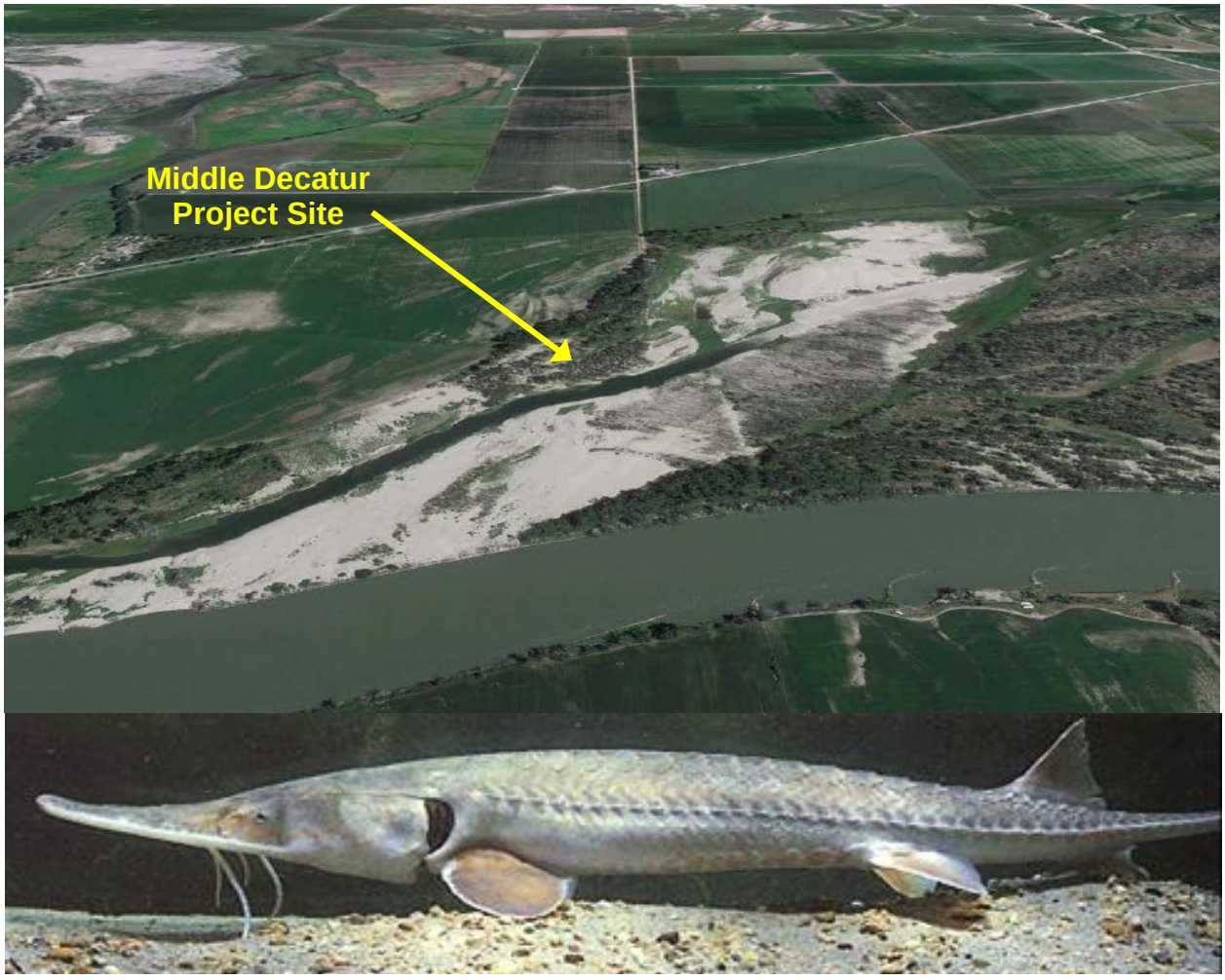
U.S. Army Corps of Engineers
Omaha District

Water Quality Sampling Report and Factual Determinations

Results of Sediment Sampling and Elutriate Testing at the Proposed Middle Decatur Shallow Water Habitat Project Site



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Water Quality Sampling Report
and
Factual Determinations

Results of Sediment Sampling and Elutriate Testing at the Proposed Middle Decatur Shallow Water Habitat Project Site

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Engineering Division
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July 2013

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1 BACKGROUND INFORMATION

1.1 Project Description

A project is being proposed to restore previously constructed shallow-water habitat (SWH) along Middle Decatur Bend of the Missouri River in Burt County, Nebraska. The U.S. Army Corps of Engineers (USACE) is constructing SWH along the lower Missouri River downstream of Gavins Point Dam to mitigate aquatic habitat lost from past bank stabilization and channelization, and enhance habitat for the endangered pallid sturgeon (*Scaphirhynchus albus*) population along the lower Missouri River. The Omaha District (District) is referring to the proposed project as the Middle Decatur project. The District plans to restore connectivity to previously constructed SWH by cleaning out the original flow path and excavating a new inlet. The removal of newly deposited sediment will involve hydraulic dredging and it is proposed that the dredge spoil be discharged to the adjacent Missouri River. It is believed the sediment to be dredged was largely deposited during the Missouri River flood of 2011 and will be primarily sand with some silts and clays. An estimated 300,000 cubic yards of sediment/soil would be excavated and discharged to the Missouri River.

1.2 Project Location

The proposed Middle Decatur project site is located along the Missouri River at RM689 just east of Decatur, Nebraska (Figure 1). The proposed project site is on the east side of the Missouri River, but within the jurisdiction of Burt County, Nebraska. Figure 2 indicates the proposed areas to be excavated at the Middle Decatur project site.

1.3 Section 404 Permitting Requirements – 404(b)(1) Guidelines

Section 404 of the Federal Clean Water Act (CWA) requires that a §404 permit be appropriately obtained prior to the discharge of any dredge or fill material into waters of the United States. The issuance of §404 permits is pursuant to the Section 404(b)(1) Guidelines for Specification of Disposal Sites for Dredged or Fill Material [40 CFR Ch. I (7-1-10 Edition)]. Fundamental to the 404(b)(1) Guidelines is the precept that dredged or fill material should not be discharged into the aquatic ecosystem, unless it can be demonstrated that such a discharge will not have an unacceptable adverse impact either individually or in combination with known and/or probable impacts of other activities affecting the ecosystems of concern. No discharge of dredged or fill material is permitted: 1) if it will cause or contribute, after consideration of disposal site dilution and dispersion, to violations of any applicable State water quality standard; 2) if it will cause or contribute to significant degradation of the waters of the United States; or 3) unless appropriate and practicable steps have been taken which will minimize potential adverse impacts of the discharge on the aquatic system.

Compliance with the 404(b)(1) Guidelines is based, in part , on "Factual Determinations" of the potential impact of the proposed dredge and fill on the aquatic environment. The §404 permitting authority is required to determine in writing the potential short-term or long-term effects of a proposed discharge of dredged or fill material on the physical, chemical, and biological components of the aquatic environment. These Factual Determinations are used in making findings of compliance or non-compliance with the restrictions on discharge. The 404(b)(1) Guidelines at §230.11 identify the following eight Factual Determinations that are to be made on the effects of each proposed discharge of dredge and fill material:

1) Physical substrate determinations.
2) Water circulation, fluctuation, and salinity determinations.
3) Suspended particulate/turbidity determinations.

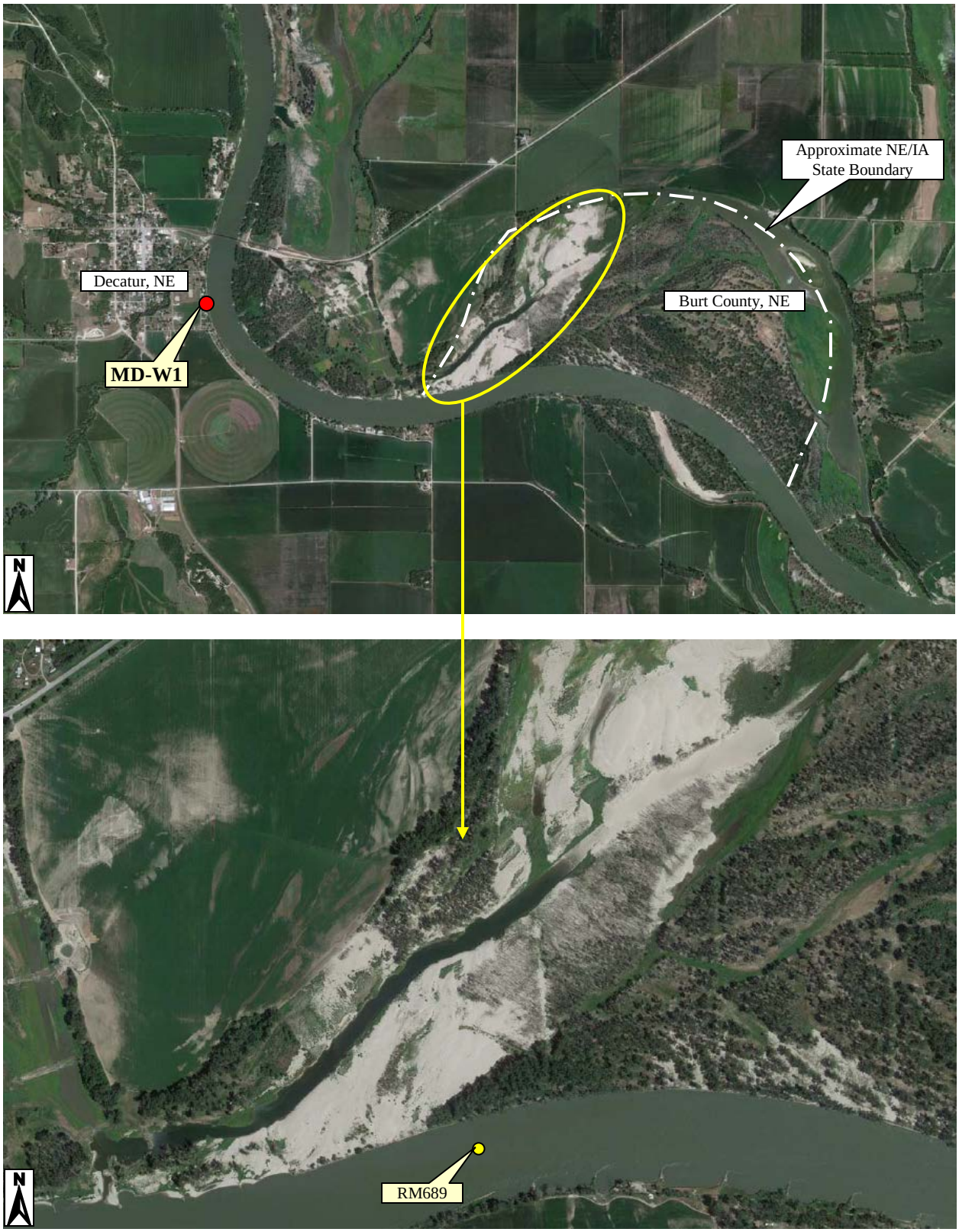


Figure 1. Location of proposed Middle Decatur shallow water habitat project site along the Missouri River east of Decatur, NE. *(Imagery Date: 18-July-2012, Google Earth)*

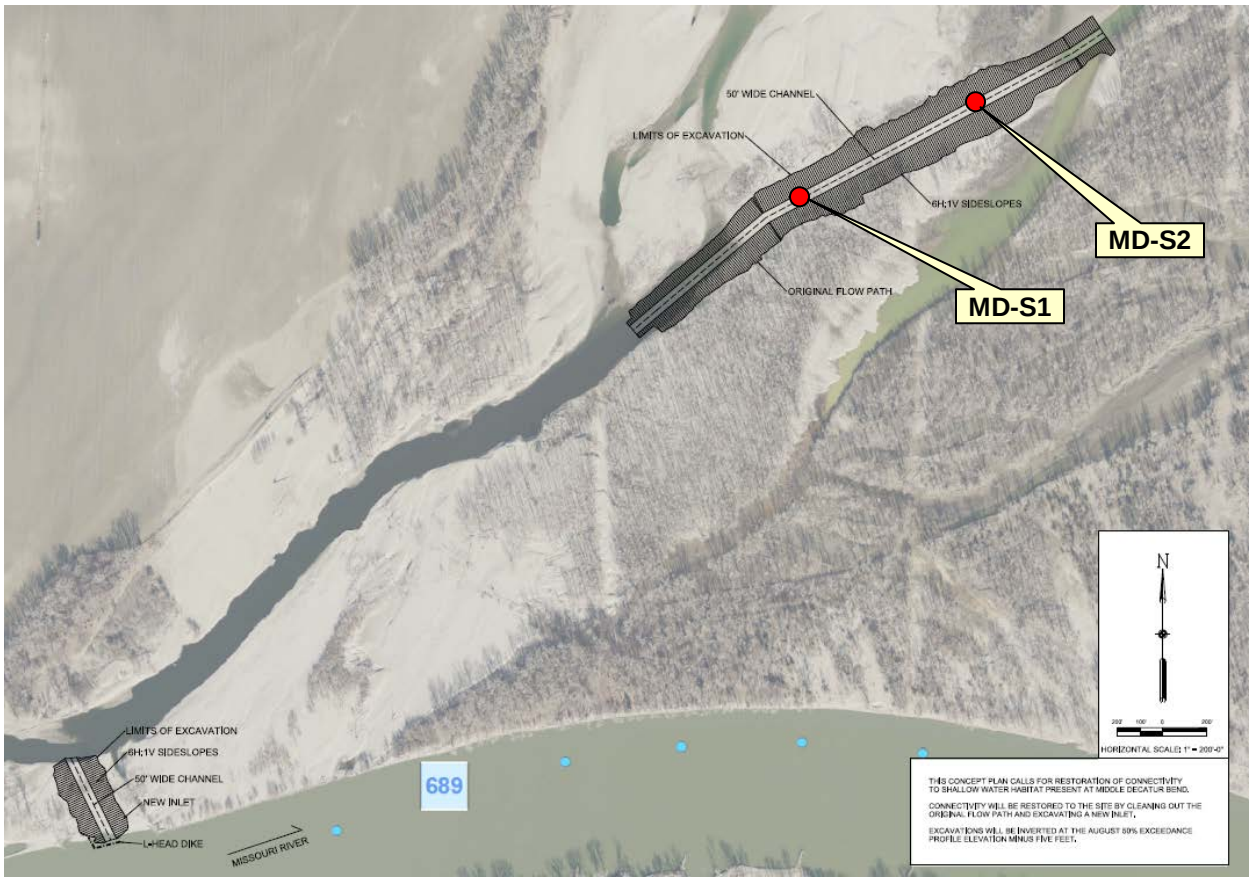


Figure 2. Proposed area to be excavated to restore shallow-water habitat at the proposed Middle Decatur project area. Locations where sediment/soil samples were collected are shown.

4) Contaminant determinations.
5) Aquatic ecosystem and organism determinations.
6) Proposed disposal site determinations.
7) Determination of cumulative effects on the aquatic ecosystem.
8) Determination of secondary effects on the aquatic ecosystem.

The intent of this report is to provide Factual Determinations of the potential water quality impacts of the proposed hydraulic dredging discharge at the Middle Decatur project site on the Missouri River. As defined in the Federal CWA and USACE Regulation No. 1110-2-8154, water quality is defined as the physical, chemical, and biological characteristics of water. This report specifically provides information for water quality Factual Determinations regarding:

- Physical substrate determinations,
- Suspended particulate/ turbidity determinations,
- Contaminant determinations,
- Proposed disposal site determinations.

The following describe the Factual Determinations that are to be made pursuant to the 404(b)(1) Guidelines regarding water quality impacts.

1.3.1 Physical Substrate Determinations

Determine the nature and degree of effect that the proposed discharge will have on the characteristics of the substrate at the proposed disposal site. Consideration shall be given to the similarity in particle size, shape, and degree of compaction of the material proposed for discharge and the material constituting the substrate at the disposal site, and any potential changes in substrate elevation and bottom contours, including changes outside of the disposal site which may occur as a result of erosion, slumpage, or other movement of the discharged material.

1.3.2 Suspended Particulate/Turbidity Determinations

Determine the nature and degree of effect that the proposed discharge will have in terms of potential changes in the kinds and concentrations of suspended particulate/turbidity in the vicinity of the disposal site. Consideration is to be given to the grain size of the material proposed for discharge, the shape and size of the plume of suspended particulates, the duration of the discharge and resulting plume and whether or not the potential changes will cause violations of applicable water quality standards.

1.3.3 Contaminant Determinations

Determine the degree to which the material proposed for discharge will introduce, relocate, or increase contaminants. This determination shall consider the material to be discharged, the aquatic environment at the proposed disposal site, and the availability of contaminants.

1.3.4 Proposed Disposal Site Determinations

The disposal site is specified through the application of the 404(b)(1) Guidelines. The mixing zone associated with the discharge is to be confined to the smallest practicable zone that is consistent with the type of dispersion determined to be appropriate. In a few special cases under unique environmental conditions, where there is adequate justification to show that widespread dispersion by natural means will result in no significantly adverse environmental effects, the discharged material may be intended to be spread naturally in a very thin layer over a large area of the substrate rather than be contained within the disposal site.

1.4 Section 401 Water Quality Certification

Under §401 of the Federal CWA an applicant for a federal license or permit (i.e. §404 permit) must obtain a certification that the discharge and activity is consistent with State or Tribal effluent limitations (CWA §301), water quality related effluent limitations (CWA §302), water quality standards and implementation plans (CWA §303), national standards of performance (§306), toxic and pretreatment effluent standards (CWA §307) and "any other appropriate requirement of State or Tribal law set forth in such certification." Regarding the Middle Decatur project, a §401 water quality certification will be requested from the Nebraska Department of Environmental Quality (NDEQ). This report and water quality Factual Determinations will be provided to the NDEQ to appropriately facilitate their water quality certification review pursuant to §401.

1.5 Water Quality Standards Classifications of the Missouri River

1.5.1 Nebraska

The State of Nebraska has designated the following uses to the entire length of the Missouri River in Nebraska: Primary Contact Recreation, Warmwater Aquatic Life Class A, Agricultural Water Supply,

and Aesthetics. It has designated the use of public drinking water supply to the river downstream of the confluence of the Niobrara River, and industrial water supply to the river downstream of the confluence of the Big Sioux River. Nebraska has not identified the Missouri River in the vicinity of the Middle Decatur project as a National or State Resource Water. As appropriate, Nebraska's antidegradation policy provides Tier 2 protection (existing water quality) to the Missouri River. Tier 1 protection (existing uses) applies and the State designated beneficial uses must be protected and associated numeric and narrative water quality criteria to protect these beneficial uses are not to be violated.

1.5.2 Iowa

The State of Iowa designates the following uses to the Missouri River from the Iowa-Missouri state line to the confluence with the Big Sioux River: Primary Contact Recreation, Warmwater Type 1 Aquatic Life, and Human Health. The Missouri River at the Council Bluffs water works intake is also designated a use of raw water source of potable water supply. Pursuant to Iowa's antidegradation policy, the Missouri River in the vicinity of the proposed Middle Decatur project is not identified as an outstanding State water (Tier 2 ½) or an outstanding National Resource Water (Tier 3). As appropriate, Iowa's antidegradation policy provides Tier 2 protection (existing water quality) to the Missouri River. Tier 1 protection (existing uses) applies and the State designated beneficial uses must be protected and associated numeric and narrative water quality criteria to protect these beneficial uses are not to be violated.

1.6 Use of Sediment/Soil Analysis, Elutriate Testing, and Ambient Missouri River Water Quality Data for Factual Determinations

Factual Determinations regarding potential water quality impacts from the proposed hydraulic dredging to construct SWH at the proposed Middle Decatur project was based on the analyses of representative sediment/soil samples collected from the identified excavation area at the proposed project site. The collected sediment/soil samples were also subjected to elutriate testing pursuant to the Inland Testing Manual, "Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S. – Testing Manual (USEPA and USACE, 1998). Historic ambient water quality data collected along the Missouri River by the District were assessed.

2 SITE-SPECIFIC WATER QUALITY CONCERNS

2.1 Fish Consumption Advisory

The State of Nebraska had issued a fish consumption advisory for Dieldrin and PCBs on the Missouri River downstream of Gavins Point Dam. This advisory was based on the analysis of past fish tissue sampling that found levels of these substances at concentrations above the State's defined risk factor for protecting public health via fish consumption. However, the fish consumption advisory has recently been removed based on recent fish tissue sampling (NDEQ, 2012).

2.2 Section 303(d) Impaired Waters Listings

Section 303(d) of the Federal CWA requires States to evaluate water quality conditions in designated waterbodies, and list as impaired (i.e. 303(d) list) any waterbodies not meeting water quality standards. As appropriate, States must develop and implement Total Maximum Daily Loads –TMDLs (i.e. pollutant management plans) for waterbodies identified as impaired.

2.2.1 Nebraska

Nebraska's water quality standards identify the Missouri River from the Big Sioux River to the Platte River as designated Segment MT1-10000. Segment MT1-10000 is listed on Nebraska's 2012 Section 303(d) list as impaired due to a fish consumption advisory. The identified parameters of concern are Cancer Risk & Hazard Index Compounds, specifically, Dieldrin and PCBs. After the NDEQ published their 2012 Integrated Water Quality Report and Section 303(d) list on 1-April-2012 that listed Segment MT1-10000 as impaired due to the fish consumption advisory in effect, the NDEQ published the report, "Findings of the 2010 Regional Ambient Fish Tissue Program in Nebraska" in June, 2012 (NDEQ, 2012). That report indicated that Dieldrin and PCBs were no longer a fish tissue concern on Segment MT1-10000. This resulted in the fish consumption advisory for the Missouri River regarding Dieldrin and PCBs being removed. Based on the removal of the fish consumption advisory for the Missouri River, the NDEQ has indicated that the 303(d) listing of the Missouri River for Dieldrin and PCBs will be removed in the next published 303(d) listing (personal communication NDEQ). As such, the Missouri River in the area of the proposed Middle Decatur project site will not be identified as impaired from Cancer Risk & Hazardous Index Compounds (i.e. Dieldrin and PCBs) by Nebraska's next 303(d) list of impaired waters. Personnel communication with NDEQ has indicated that elutriate testing for Dieldrin and PCBs to a detection limit of 0.4 parts-per-trillion is no longer required.

2.2.2 Iowa

Iowa has not listed the Missouri River in the area of the proposed Middle Decatur project site on the State's most recent (i.e. 2010) 303(d) impaired waters list.

2.3 Nutrients

2.3.1 Gulf of Mexico Hypoxia

A large area of the northern Gulf of Mexico is experiencing low dissolved oxygen or hypoxia during periods in the summer off the coasts of Louisiana and Texas. The hypoxia is primarily caused by excess nutrients – originating from cities, farms, and industries in the Mississippi River Basin – which cause extensive growths of algae that deplete the oxygen in the water when they die, sink to the bottom, and decompose. The condition is exacerbated by the stratification of the water column – result of warmer, low salinity surface waters that isolate the organic-rich bottom waters from the surface and prevent oxygen exchange with the atmosphere. Nutrient loading reduction targets of 45% of the current total nitrogen and total phosphorus riverine loads have been identified to achieve the goal for hypoxic zone size and to facilitate water quality improvements in the basin (MRGMWNTF, 2008).

The watershed of the Mississippi River drains 41 percent of the contiguous United States and includes waters from several major river systems, including the Missouri/Platte River Basin, the Ohio/Tennessee River Basin, and the Arkansas/Red/White River Basin. The Mississippi River Basin includes two functionally distinct zones, each with its own potential to contribute to Gulf hypoxia. These zones include the huge Mississippi watershed with its tributary network, and at the lower end of the river system, the deltaic zone that formerly dispersed river water naturally throughout Southeast Louisiana via a distributary (deltaic) network. While the tributaries of the Mississippi River are the sources of nutrient loading to the river trunk, the distributaries within the Mississippi Delta are critical to the final dispersal of nutrients and sediments into the Gulf of Mexico and the salinity of the estuaries and coastal waters. During the past two centuries the hydrology of the distributary zone was totally modified by the construction of flood levees, closing of key distributaries for flood control, and navigation enhancement programs. These structures isolated the river from its delta, causing an ongoing catastrophic collapse in the deltaic landscape, primarily wetlands. The hydrologic changes that have caused such damage to South

Louisiana also exacerbate Gulf hypoxia by jetting most nutrient-rich river water and sediments directly into the Gulf of Mexico, bypassing the deltaic wetlands that captured the nutrients and sediments.

2.3.2 Iowa Nutrient Reduction Strategy

The 2008 Gulf Hypoxia Action Plan calls for the 12 states along the Mississippi River to develop strategies to reduce nutrient loading to the Gulf of Mexico (MRGMWNTF, 2008). In this regard, the State of Iowa has recently finalized the *"Iowa Nutrient Reduction Strategy – A science and technology-based framework to assess and reduce nutrients to Iowa waters and the Gulf of Mexico"* (IDALS et. al., 2013). The Iowa strategy follows the recommended framework provided by EPA in 2011, and is only the second state to complete a statewide nutrient reduction strategy. The Iowa Nutrient Reduction Strategy is a science and technology-based framework to assess and reduce nutrients to Iowa waters and the Gulf of Mexico. It is designed to direct efforts to reduce nutrients in surface water from both point and nonpoint sources in a scientific, reasonable and cost-effective manner. The Iowa strategy proposes a pragmatic, strategic and coordinated approach for reducing nutrient loads discharged from the state's largest wastewater treatment plants, in combination with targeted practices designed to reduce loads from nonpoint sources now while evaluating the future need for nutrient water quality standards.

For Iowa streams, EPA's recommended water quality standards' criteria range is from 0.712 to 3.26 mg/L for total N and from 0.070 to 0.118 mg/L total P (IDALS et.al., 2013). If these nutrient criteria recommendations were adopted as Iowa water quality standards, cities would be required to pay for expensive wastewater treatment plant upgrades that would address only a fraction of the overall amount of nutrients discharged to Iowa's streams while leaving wastewater treatment facilities unable to comply with permit limits (IDALS et.al., 2013). If compliance with stringent numeric effluent limits on point source discharges did not eliminate an existing impairment, the receiving stream would continue to exceed the water quality standard and would require development of a total maximum daily load (TMDL). At that point, any further reduction required by a TMDL would need to be accomplished through voluntary controls placed only on nonpoint sources. Because of the lack of confidence in EPA's recommended criteria and substantial financial costs associated with implementing nutrient removal technologies, legitimate concerns about the value of numeric nutrient criteria have been raised (IDALS, et.al., 2013). Other criteria derivation approaches such as nutrient stressor-response analysis and reference condition modeling are better alternatives that Iowa will continue assessing as a basis for appropriate nutrient standards for implementation within an adaptive watershed management framework (IDALS et.al, 2013).

2.4 National Research Council of the National Academies Assessment of Missouri River Water Quality and Sediment Management

USACE's SWH and emergent sandbar habitat (ESH) projects are directly depositing sediment into the mainstem Missouri River. Concerns have been expressed regarding the potential water quality impacts of those projects downstream and into the northern Gulf of Mexico. The following questions were tasked to the National Research Council regarding water quality and sediment management in the Missouri River:

- *What is the significance of the Missouri River sediments to the Gulf of Mexico hypoxia problem?*
- *What are the key environmental and economic considerations regarding nutrient loads and/or contaminants in Missouri River sediment? To what extent can such issues be addressed with management strategies?*

The following discussion and conclusions are taken from the document, "Missouri River Planning – Recognizing and Incorporating Sediment Management" prepared by the National Research Council (NRC, 2011).

Excess nitrogen loads are responsible for the long-term increase in the hypoxic area in the northern Gulf of Mexico; however, recent studies suggest that phosphorus may also be contributing to hypoxia, especially near the mouths of the Mississippi and Atchafalaya Rivers during the spring. The USACE's construction of SWH projects will result in releases of both nitrogen and phosphorus to the Missouri River because much of the topsoil portion of the sediment disposed of in the river has been heavily fertilized.

The National Research Council further assessed the situation based on total nitrogen (TN) and total phosphorus (TP) levels representative of excavated sediment/soil at SWH project sites and current TN and TP loads in the Missouri River and delivered to the Gulf of Mexico. It was concluded that the TN loads from constructed SWH projects will be insignificant compared to the current TN loads transported in the Missouri River and to the Gulf. Phosphorus loadings to the Missouri River from these projects, however, are likely to constitute a much greater fraction of the current load than additional nitrogen loadings. An upper-bound estimate of the increase in TP loadings to the Gulf of Mexico as a result of all potential SWH projects is a 6 to 12 percent increase. This estimate represents an upper bound assuming all sediment is delivered to the Gulf. In reality, sediment deposition processes in the Missouri and lower Mississippi river channels would reduce loads delivered downstream and eventually to the Gulf of Mexico. A comparison of potential phosphorus loads from USACE's SWH projects, with load increments required to produce measurable changes in the areal extent of Gulf hypoxia, showed these projects will not significantly change the extent of the hypoxic area in the Gulf of Mexico.

3 SAMPLING AND ANALYSIS METHODS

Sediment/soil samples, representative of the areas to be excavated for SWH construction at the proposed Middle Decatur project site, were collected, analyzed, and subjected to elutriate testing. The results were used to assess the potential water quality impacts that the discharge from hydraulic dredging at the proposed project site would have on the Missouri River. Sediment/soil sampling occurred in April 2013.

3.1 Quality Control Plan

A Quality Control Plan (QCP) was developed to collect sediment/soil samples at the proposed Middle Decatur project site and conduct elutriate testing of the collected samples. The QCP was developed in consultation with the NDEQ. The QCP was implemented as written with no modifications and is included as Attachment 1. The parameters that were measured in the field and analyzed in the laboratory for the collected sediment/soil samples and prepared samples for elutriate testing are listed in Table 1. Analytical methods are provided in the attached QCP (Attachment 1).

Table 1. Parameters measured in the field and analyzed in the laboratory for the different media assessed as part of the sampling and elutriate testing conducted at the Middle Decatur project site.

Parameter	Sample Analysis			
	Soil	**Receiving Water**	**Pre-Elutriate Water**	**Elutriate Water**
Field Measurements:				
Water Temperature		✓		
pH		✓		
Dissolved Oxygen		✓		
Specific Conductance		✓		
Turbidity		✓		
Laboratory Analysis:				
Atrazine	✓	✓		✓*
Carbonaceous Biochemical Oxygen Demand - CBOD		✓	✓	✓*
Chemical Oxygen Demand - COD		✓		✓
Nitrogen, Ammonia as N, Total	✓	✓	✓	✓*
Nitrogen, Total Kjeldahl as N	✓	✓	✓	✓*
Nitrogen, Nitrate-Nitrite as N	✓	✓	✓	✓
Organic Carbon, Total - TOC	✓	✓	✓	✓*
Particle Size	✓			
Percent Solids	✓			
Pesticide Scan	✓			
pH	✓	✓		✓
Phosphorus, Dissolved		✓		✓
Phosphorus, Total	✓	✓	✓	✓*
Phosphorus, Orthophosphate		✓		✓
Metals Scan (Dissolved)**		✓		✓
Metals Scan (Total)**			✓	✓*
Metals - Total (Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Zinc)	✓			
Organochlorine Pesticide and PCB Scan	✓	✓		✓*
Total Suspended Solids		✓	✓	✓*
Turbidity		✓	✓	✓*
E. coli Bacteria	✓			

***** Determined on supernatant prior to filtration.

** Metals scan includes: Aluminum, Antimony, Arsenic, Beryllium, Cadmium, Calcium, Chromium III, Copper, Iron, Lead, Magnesium, Manganese, Mercury, Nickel, Selenium, Silver, Thallium, and Zinc.

3.2 Collection of Sediment/Soil Samples

Three sediment/soil samples were collected at two sites at the proposed Middle Decatur project site for elutriate testing on 26-Apr-2013. The two locations where the sediment/soil samples were collected are shown in Figure 2 and Figure 3 and described in Table 2 and Table 3. The sediment samples at each of the two sites were collected with a gas-powered auger equipped with a 2-in diameter stainless steel coring bit. Core samples were collected to a depth of 4 feet and composited. An additional core sample (i.e. MD-S2B) was collected at site MD-S2 and composited from a depth of 4 to 7 feet. This sample was analyzed for sediment/soil parameters only (i.e. no pre-elutriate or elutriate testing of the collected sample was done). For elutriate testing, 1-gallon of the composited sediment/soil material was collected and transported to the laboratory for analysis.

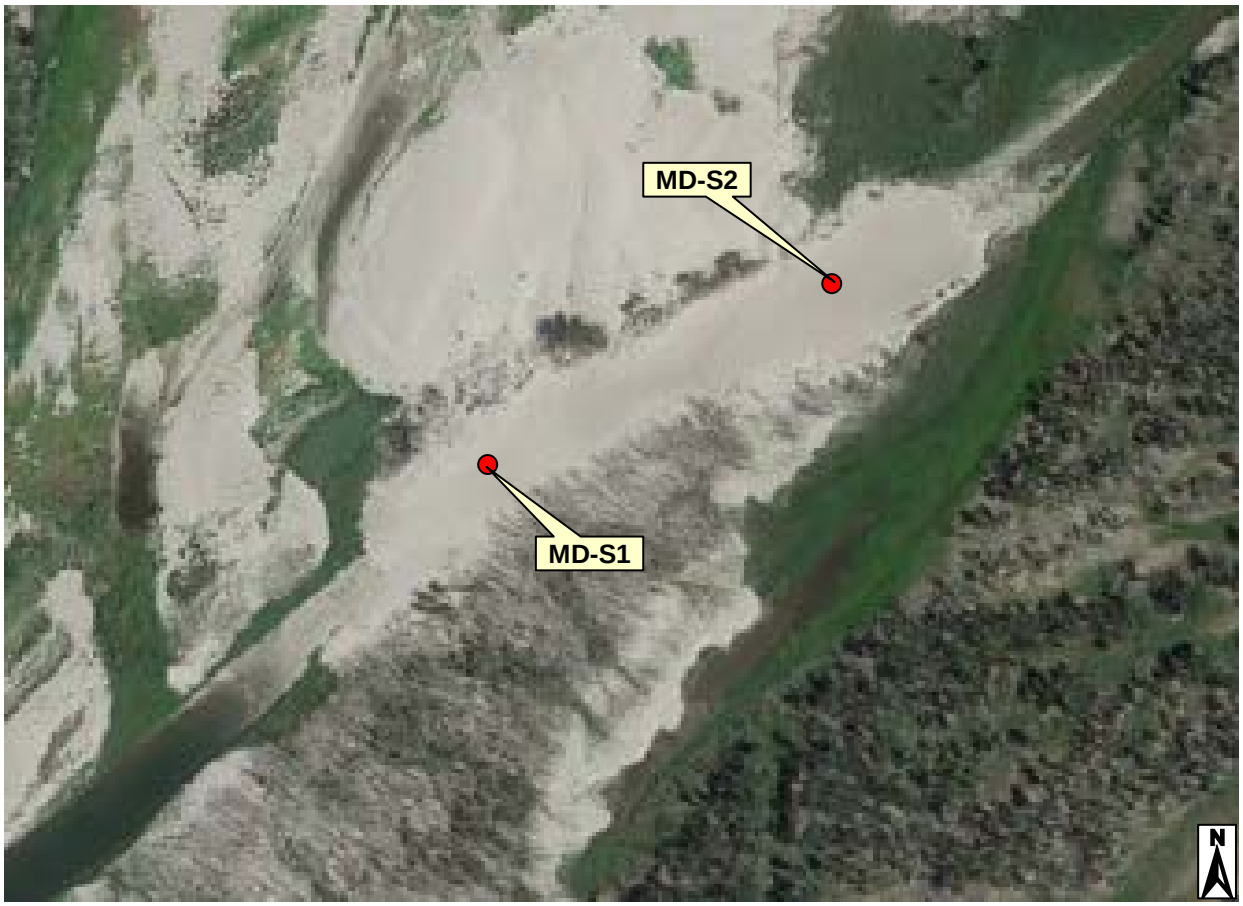


Figure 3. Locations where sediment/soil samples were collected at the proposed Middle Decatur shallow-water habitat site. *(Imagery Date: 18-July-2012, Google Earth)*

3.3 Collection of Receiving Water

In accordance with the "*Inland Testing Manual*", receiving water was collected from the Missouri River for elutriate testing. Receiving water measurements and samples were collected from the Missouri River at site MD-W1 at the Decatur, NE boat ramp (Figure 1). The mean daily flow of the Missouri River at Decatur, NE (RM691) when receiving water samples were collected on 26-Apr-2013 was 17,700 cfs.

Table 2. Sediment/soil samples collected at the proposed Middle Decatur shallow-water habitat project site for analysis and elutriate testing.

Sample Type	Sample ID	Sample Date	Sampled Depth	Sampling Method
Sediment/Soil	MD-S1	26-Apr-2013	0 - 4 feet	Composite Core
Sediment/Soil	MD-S2A	26-Apr-2013	0 - 4 feet	Composite Core
	MD-S2B		4 - 7 feet	

Note: The deeper sediment/soil sample collected at site MD-S2 (i.e. MD-S2B) was only analyzed for sediment/soil parameters – i.e. pre-elutriate and elutriate testing was not done.

Table 3. Geo-referenced locations where sediment/soil samples were collected for analysis and elutriate testing at the proposed Middle Decatur shallow-water habitat project site.

Site	Latitude	Longitude
MD-S1	42° 00’ 14.0”	96° 12’ 36.5”
MD-S2	42° 00’ 18.3”	96° 12’ 26.4”

Note: GPS device used for determining locations was Garmin Map 76.

3.4 Elutriate Testing

The process that was used to prepare samples for elutriate testing from the sediment/soil samples collected at the proposed Middle Decatur project site is depicted in Figure 4.

3.4.1 Elutriate Samples

Elutriate samples were prepared in accordance with the “*Inland Testing Manual*”, and were prepared by using receiving water collected from the Missouri River at site MD-W1. The samples were prepared in the laboratory by sub-sampling 1-liter of the collected sediment/soil sample from the well-mixed original sample. The sediment material and unfiltered receiving water were then combined in a sediment-to-water ratio of 1:4 on a volume basis at room temperature (22 ± 2°C). The 1:4 sediment-to-water ratio is believed to represent “end-of-pipe” discharge conditions for hydraulic dredging. After the correct ratio was achieved, the mixture was stirred vigorously for 30 minutes with a mechanical stirrer/shaker. After the 30-minute mixing period, the mixture is allowed to settle for one hour. The supernatant was then siphoned off without disturbing the settled material. Analysis for total constituents was done on the supernatant without filtration, and the supernatant was filtered through a 0.45-micron filter for analysis of dissolved constituents. The filtered water is the standard elutriate sample identified by the *“Inland Testing Manual”* and represents the dissolved constituents that could be released from dredged material during the hydraulic dredging process.

3.4.2 Pre-Elutriate Samples

Prepared pre-elutriate samples were analyzed. The pre-elutriate samples were prepared the same as standard elutriate samples through the point of the 30-minute mixing period. At that time an aliquot of water was immediately drawn off the mixed solution and identified as the pre-elutriate sample. The pre-elutriate sample was analyzed for the following constituents: Total Kjeldahl Nitrogen, Total Ammonia Nitrogen, Total Nitrate-Nitrite Nitrogen, Total Phosphorus, Total Organic Carbon, Total Metals Scan, Total Suspended Solids, Turbidity, and pH. The pre-elutriate sample is believed to represent conditions of the “end-of-pipe” hydraulic dredging discharge slurry prior to any mixing with the receiving water (i.e. Missouri River).

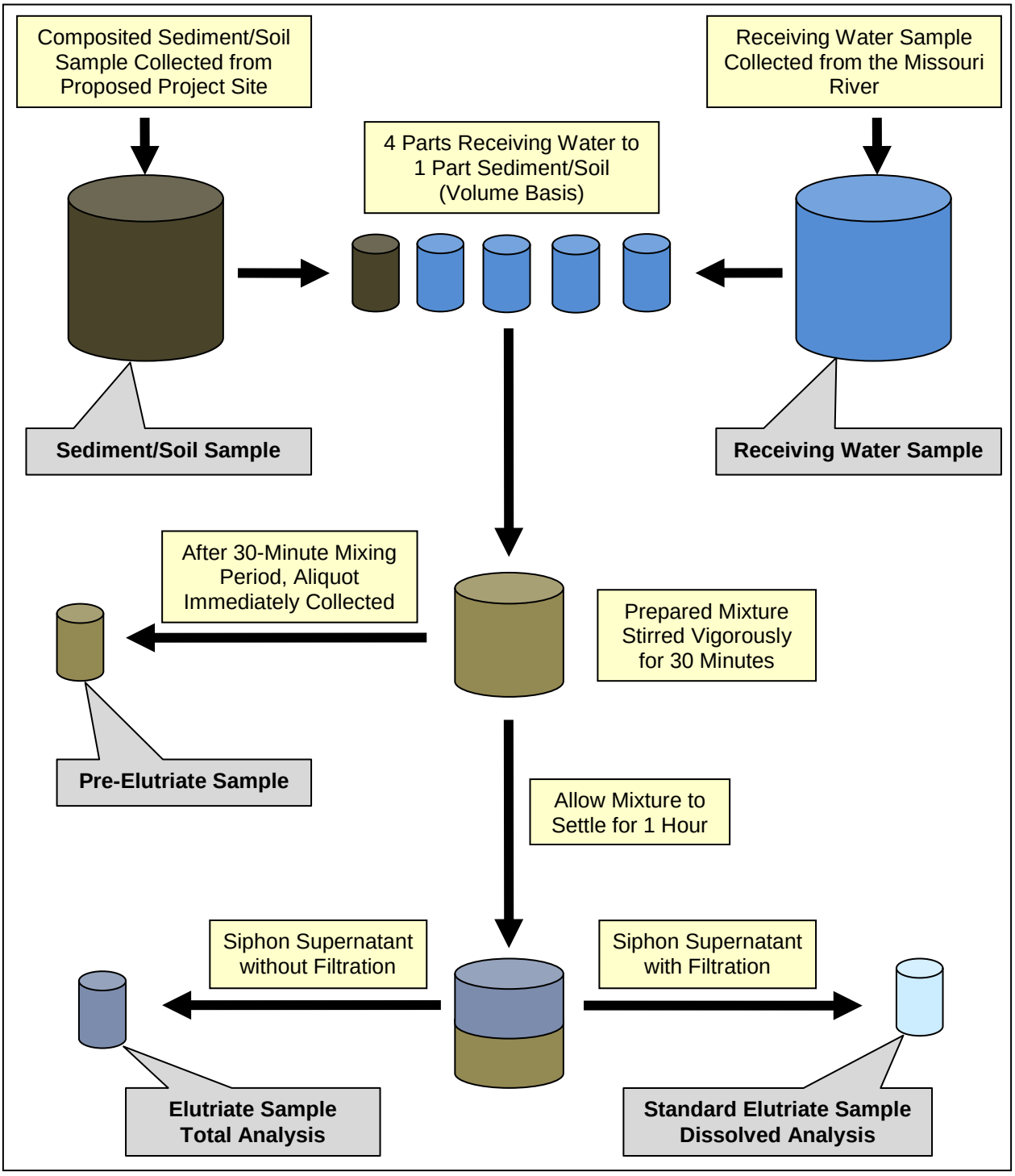


Figure 4. Process used to prepare samples for elutriate testing from sediment/soil samples collected at the proposed Middle Decatur project site.

3.4.3 Metal Analysis

The metals Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, and Zinc were identified as parameters of concern by the State of Nebraska. Collected sediment/soil samples were directly analyzed for these metals. Total and dissolved metals scans were run on the collected receiving water and appropriately run on the prepared elutriate samples. Many of Nebraska's water quality standards for metals are hardness based. The District has monitored ambient water quality conditions of the Missouri River at Decatur, NE (RM691) over the 10-year period 2003 through 2012. Based on 34 quarterly measurements, hardness (mg/L) in the Missouri River ranged from 232 to 381, averaged 272, and had a median of 266. The hardness of the receiving water sample collected on 26-Apr-2013 was 279 mg/L.

4 RESULTS

4.1 Receiving Water Field Measurements

The receiving water used for the elutriate testing was collected from the Missouri River at site MD-W1. Water quality conditions of the receiving water measured in the field on 26-Apr-2013 at the time of collection were: Water Temperature, 8.4°C; Dissolved Oxygen, 12.0 mg/l and 105.0% saturation; pH, 8.1 S.U.; Specific Conductance, 818 µS/cm; and Turbidity, 44 NTU.

4.2 Particle Size Analysis

The collected sediment/soil samples used for elutriate testing were analyzed for particle size using Method ASTM D422. The Particle Size Distribution Reports for the analyzed sediment/soil samples collected at sites MD-S1, MD-S2A, and MD-S2B are provided in Attachment 2. Table 4 and Figure 5 summarize the particle size percent composition of the collected sediment/soil samples. The collected sediment/soil samples ranged from 81.3% to 98.6% sand and 1.3% to 18.3% fines. None of the collected sediment/soil samples contained material of a grain size greater than sand (Table 4).

Table 4. Summary of particle size analysis of the sediment/soil samples collected at the proposed Middle Decatur project site.

Sample ID	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
MD-S1	0.0	0.0	0.0	0.4	16.9	64.4	14.0	4.3
MD-S2A	0.0	0.0	0.0	0.1	3.8	93.3	1.8	1.0
MD-S2B	0.0	0.0	0.0	0.1	6.1	92.5	0.3	1.0
MEAN	**0.0**	**0.0**	**0.0**	**0.2**	**8.9**	**83.4**	**5.4**	**2.1**

See Attachment 2 for defination of particle sizes.

4.3 Physiochemical Analysis of Sediment/Soil and Receiving Water Samples and Elutriate Testing Results

The laboratory reports of the analyses of the sediment/soil, receiving water, pre-elutriate, and elutriate samples are provided in Attachment 3. The following summarizes these results and their application to Nebraska water quality standards.

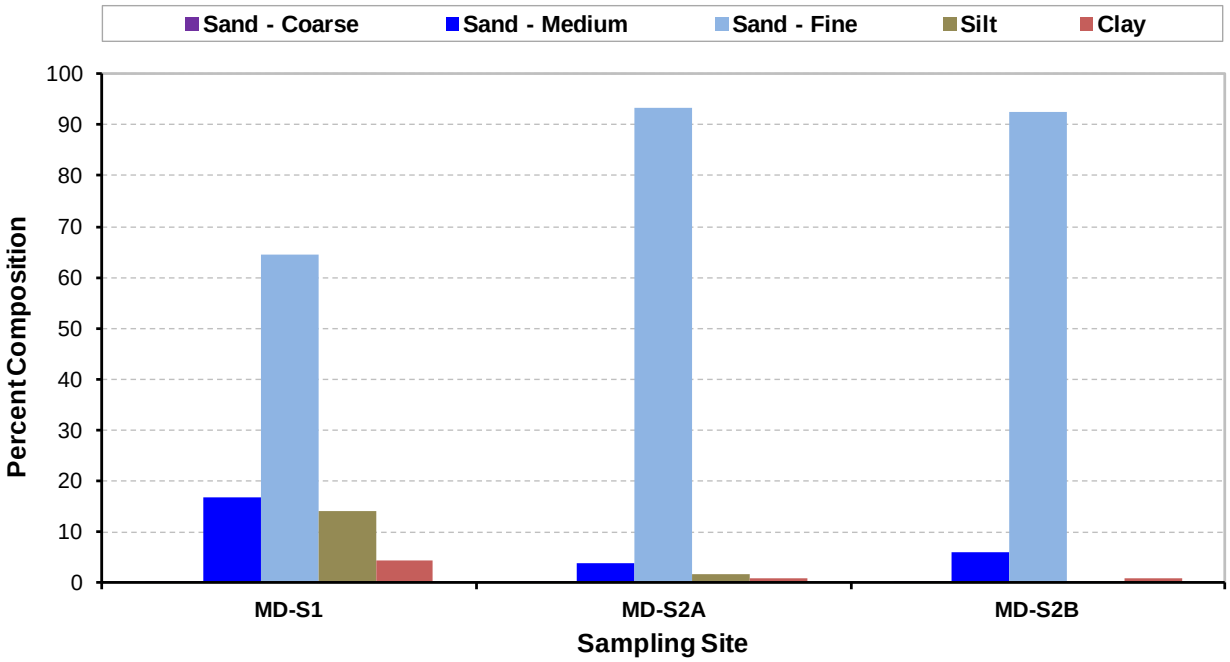


Figure 5. Particle size percent composition of sediment/soil samples collected at sites MD-S1, MD-S2A, and MD-S2B.

4.3.1 Analyzed Constituents with Promulgated State Water Quality Standards

The following constituents were analyzed and have water quality standards criteria promulgated by the State of Nebraska:

- Ammonia Nitrogen
- Atrazine
- Metals
  - Aluminum
  - Antimony
  - Arsenic
  - Beryllium
  - Cadmium
  - Chromium III
  - Copper
  - Iron
  - Lead
  - Manganese
  - Mercury
  - Nickel
  - Selenium
  - Silver
  - Thallium
  - Zinc
- Nitrate-Nitrite Nitrogen
- Organochlorine Pesticides (Scan)
- Polychlorinated Biphenyls – PCBs (Scan)
- pH

4.3.1.1 *Ammonia Nitrogen*

Constituent: Ammonia Nitrogen						
		Receiving Water (Missouri River)		Pre-Elutriate Water	Elutriate Water	
Sample Location	Sediment/Soil (mg/kg)	Total (mg/L)	Dissolved (mg/L)	Total (mg/L)	Non-Filtered Total Analysis (mg/L)	Filtered Dissolved Analysis (mg/L)
MD-S1	3.4	0.06		< 0.1	0.63	0.63
MD-S2A	1.3	0.06		< 0.1	0.04	0.03
MD-S2B	1.4					
MEAN	**2.0**	**-----**		**< 0.1**	**0.34**	**0.33**

For application of water quality standards criteria for Ammonia, field measured pH and temperature of the Missouri River when sediment/soil samples collected were 8.1 S.U and 8.4°C, respectively.

Nebraska Water Quality Standards – Ammonia as N; Warmwater Aquatic Life Class A

Constituent	Acute Standard	Chronic Standard
Ammonia (Total as N) *Early Life Stages Present* *pH = 8.1, Temperature (℃) = 8.4*	6.9 mg/L	2.1 mg/L

Comparison of Ammonia Elutriate Tests to Water Quality Standards

All pre-elutriate and non-filtered and filtered elutriate tests of the collected sediment/soil samples at the proposed Middle Decatur project site were less than the Nebraska acute and chronic criteria for Ammonia.

Comparison of Depth-Discrete Sediment/Soil Samples Collected at Site MD-S2

The depth discrete sediment/soil samples collected at site MD-S2 had similar measured Ammonia levels.

4.3.1.2 *Atrazine*

Constituent: Atrazine						
		Receiving Water (Missouri River)		Pre-Elutriate Water	Elutriate Water	
Sample Location	Sediment/Soil (mg/kg)	Total (μg/L)	Dissolved (μg/L)	Total (μg/L)	Non-Filtered Total Analysis (μg/L)	Filtered Dissolved Analysis (μg/L)
MD-S1	< 0.002	< 0.08			< 0.08	
MD-S2A	< 0.002	< 0.08			< 0.08	
MS-S2B	< 0.002					
MEAN	**< 0.002**	**-----**			**< 0.08**	

NEBRASKA WATER QUALITY STANDARDS – Atrazine; Warmwater Aquatic Life Class A and Public Drinking Water

Constituent	Acute Standard	Chronic Standard	Public Drinking Water Standard
Atrazine	330 μg/L	12 μg/L	3 μg/L

Comparison of Atrazine Elutriate Tests to Water Quality Standards

All non-filtered elutriate tests of the collected sediment/soil samples at the proposed Middle Decatur project site were less than the Nebraska acute, chronic, and public drinking water criteria for Atrazine.

Comparison of Depth-Discrete Sediment/Soil Samples Collected in 2013 at Site MD-S2

The shallower and deeper sediment/soil samples at site MD-S2 both had non-detectable levels of Atrazine.

4.3.1.3 *Metals – Aluminum*

Constituent: Metals - Aluminum						
		Receiving Water (Missouri River)		Pre-Elutriate Water	Elutriate Water	
Sample Location	Sediment/Soil (mg/kg)	Total (mg/L)	Dissolved (mg/L)	Total (mg/L)	Non-Filtered Total Analysis (mg/L)	Filtered Dissolved Analysis (mg/L)
MD-S1		1.44	< 0.03	260.1	0.63	0.63
MD-S2A		1.44	< 0.03	92.9	0.04	0.03
MS-S2B						
MEAN		-----	-----	176.5	0.33	0.33

NEBRASKA WATER QUALITY STANDARDS – Aluminum; Warmwater Aquatic Life Class A and Public Drinking Water

Constituent	Acute Standard (Dissolved)	Chronic Standard (Dissolved)	Public Drinking Water Standard (Secondary)
Aluminum	0.750 mg/L	0.087 mg/L	0.2 mg/L

Comparison of Aluminum Elutriate Tests to Water Quality Standards

All of the filtered elutriate tests were less than the acute Warmwater Aquatic Life Class A criterion for Aluminum. One of the two filtered elutriate tests exceeded the chronic Warmwater Aquatic Life Class A criterion for Aluminum. One of the non-filtered elutriate tests exceeded the 0.2 mg/l Public Drinking Water secondary standard. However, Nebraska's water quality standards qualify the application of numerical criteria for public drinking water as follows:

> *"If the natural background level of a parameter is greater than the numerical standard, this shall not in and of itself prohibit the use of the surface water. If the natural background level of a parameter is greater than the numerical standard listed below, the background level shall be used in place of the numerical criteria."*

Ambient water quality concentrations for total Aluminum in the Missouri River exceed the 0.2 mg/L public drinking water standard – the measured total Aluminum concentration of the collected receiving water was 1.44 mg/L. The non-filtered elutriate testing results were less than the total Aluminum levels measured in the collected Missouri River receiving water.

4.3.1.4 *Metals – Antimony*

Constituent: Metals - Antimony						
		Receiving Water (Missouri River)		Pre-Elutriate Water	Elutriate Water	
Sample Location	Sediment/Soil (mg/kg)	Total (µg/L)	Dissolved (µg/L)	Total (µg/L)	Non-Filtered Total Analysis (µg/L)	Filtered Dissolved Analysis (µg/L)
MD-S1		0.2	< 0.06	1.1	< 0.06	0.9J
MD-S2A		0.2	< 0.06	1.9	< 0.06	< 0.06
MS-S2B						
MEAN		-----	-----	1.5	< 0.06	0.5J

J = Estimated Value (Reported Value > Detection Limit and < Reporting Limit).

NEBRASKA WATER QUALITY STANDARDS – Antimony; Warmwater Aquatic Life Class A and Public Drinking Water

Constituent	Acute Standard	Chronic Standard	Public Drinking Water Standard
Antimony	88 µg/L	30 µg/L	5.6 µg/L

Comparison of Antimony Elutriate Tests to Water Quality Standards

All pre-elutriate, non-filtered, and filtered elutriate tests of the 2013 sediment/soil samples were less than the acute and chronic Warmwater Aquatic Life Class A and the Public Drinking Water standard.

4.3.1.5 *Metals – Arsenic*

Constituent: Metals - Arsenic						
		Receiving Water (Missouri River)		Pre-Elutriate Water	Elutriate Water	
Sample Location	Sediment/Soil (mg/kg)	Total (µg/L)	Dissolved (µg/L)	Total (µg/L)	Non-Filtered Total Analysis (µg/L)	Filtered Dissolved Analysis (µg/L)
MD-S1	4.7	3	2	197	7	1
MD-S2A	6.3	3	2	156	10	2
MS-S2B	5.7					
MEAN	**5.6**	**-----**	**-----**	**353**	**8.5**	**1.5**

J = Estimated Value (Reported Value > Detection Limit and < Reporting Limit).

NEBRASKA WATER QUALITY STANDARDS – Arsenic; Warmwater Aquatic Life Class A and Public Drinking Water

Constituent	Acute Standard (Dissolved)	Chronic Standard (Dissolved)	Public Drinking Water Standard
Arsenic	340 µg/L	16.7 µg/L	10 µg/L

Comparison of Arsenic Elutriate Tests to Water Quality Standards

The filtered elutriate tests (dissolved) for Arsenic were below the acute and chronic criteria for Aquatic Life Class A. The non-filtered elutriate tests (total) for Arsenic were at or below the Public Drinking Water standard.

Reflective of the elevated Arsenic levels analyzed in the sediment/soil samples, the pre-elutriate samples for total Arsenic were also elevated. This could represent an "end-of-pipe" concern for total Arsenic regarding public drinking water. However, the Nebraska water quality standards state that Public Drinking Water use is for surface waters which serve as a public drinking water supply. These waters must be treated (e.g., coagulation, sedimentation, filtration, chlorination) before the water is suitable for human consumption. After treatment, these waters are suitable for drinking water, food processing, and similar uses. As indicated by the non-filtered and filtered elutriate testing, Arsenic levels (total and dissolved) are at or below the 10 µg/L Public Drinking Water standard after settling and filtration. Significant dilution of the dredging discharge will immediately occur upon mixing with the Missouri River. There are no drinking water intakes in the immediate vicinity of the proposed dredging discharge at the Middle Decatur project site.

Comparison of Depth-Discrete Sediment/Soil Samples Collected in 2013 at Site IC-S1

The depth discrete sediment/soil samples collected at site MD-S2 had similar measured Arsenic levels.

4.3.1.6 *Metals – Beryllium*

Constituent: Metals - Beryllium						
		Receiving Water (Missouri River)		Pre-Elutriate Water	Elutriate Water	
Sample Location	Sediment/Soil (mg/kg)	Total (µg/L)	Dissolved (µg/L)	Total (µg/L)	Non-Filtered Total Analysis (µg/L)	Filtered Dissolved Analysis (µg/L)
MD-S1		1J	1J	13	0.5J	1J
MD-S2A		1J	1J	5	0.6J	<0.4
MS-S2B						
MEAN		**-----**	**-----**	**9**	**0.6J**	**0.6J**

J = Estimated Value (Reported Value > Detection Limit and < Reporting Limit).

NEBRASKA WATER QUALITY STANDARDS – Beryllium; Warmwater Aquatic Life Class A and Public Drinking Water

Constituent	Acute Standard (Dissolved)	Chronic Standard (Dissolved)	Public Drinking Water Standard
Beryllium	130 µg/L	5.3 µg/L	4 µg/L

Comparison of Beryllium Elutriate Tests to Water Quality Standards

All filtered elutriate tests (dissolved) of the 2013 analysis for Beryllium were below the acute and chronic criteria for Aquatic Life Class A. The non-filtered elutriate tests (total) for Beryllium were below the Public Drinking Water standard.

The pre-elutriate samples for total Beryllium could represent an "end-of-pipe" concern for total Beryllium regarding public drinking water. However, the Nebraska water quality standards state that Public Drinking Water use is for surface waters which serve as a public drinking water supply. These waters must be treated (e.g., coagulation, sedimentation, filtration, chlorination) before the water is suitable for human consumption. After treatment, these waters are suitable for drinking water, food processing, and similar uses. As indicated by the non-filtered and filtered elutriate testing, Beryllium levels (total and dissolved) are less than the 4 µg/L Public Drinking Water Standard after settling and filtration. Significant dilution of the dredging discharge will immediately occur upon mixing with the Missouri River. There are no drinking water intakes in the immediate vicinity of the proposed dredging discharge at the Middle Decatur project site.

4.3.1.7 *Metals – Cadmium*

Constituent: Metals - Cadmium						
		Receiving Water (Missouri River)		Pre-Elutriate Water	Elutriate Water	
Sample Location	Sediment/Soil (mg/kg)	Total (µg/L)	Dissolved (µg/L)	Total (µg/L)	Non-Filtered Total Analysis (µg/L)	Filtered Dissolved Analysis (µg/L)
MD-S1	0.12	0.2	< 0.02	13.2	< 0.02	< 0.02
MD-S2A	0.13	0.2	< 0.02	5.5	< 0.02	< 0.02
MS-S2B	0.10					
MEAN	**0.12**	-----	-----	**9.4**	< 0.02	< 0.02

NEBRASKA WATER QUALITY STANDARDS – Cadmium; Warmwater Aquatic Life Class A and Public Drinking Water

Constituent	Acute Standard (Dissolved)	Chronic Standard (Dissolved)	Public Drinking Water Standard
Cadmium *Hardness = 272 mg/L*	16 µg/L	0.5 µg/L	5 µg/L

Comparison of Cadmium Elutriate Tests to Water Quality Standards

The filtered elutriate tests (dissolved) for Cadmium were non-detect and below the acute and chronic criteria for Aquatic Life Class A. The non-filtered elutriate tests (total) for Cadmium were also non-detect and below the Public Drinking Water standard.

The pre-elutriate samples for total Cadmium were elevated. This could represent an "end-of-pipe" concern for total Cadmium regarding public drinking water. However, the Nebraska water quality standards state that Public Drinking Water use is for surface waters which serve as a public drinking water supply. These waters must be treated (e.g., coagulation, sedimentation, filtration, chlorination) before the water is suitable for human consumption. After treatment, these waters are suitable for drinking water, food processing, and similar uses. As indicated by the non-filtered and filtered elutriate testing, Cadmium levels (total and dissolved) are non-detect and less than the 5 µg/L Public Drinking Water standard after settling and filtration. Significant dilution of the dredging discharge will immediately occur upon mixing with the Missouri River. There are no drinking water intakes in the immediate vicinity of the proposed dredging discharge at the Middle Decatur project site.

Comparison of Depth-Discrete Sediment/Soil Samples Collected at Site MD-S2

The depth-discrete sediment/soil samples at site MD-S2 had similar measured Cadmium levels.

4.3.1.8 *Metals – Chromium III*

Constituent: Metals – Chromium III						
		Receiving Water (Missouri River)		Pre-Elutriate Water	Elutriate Water	
Sample Location	Sediment/Soil (mg/kg)	Total (µg/L)	Dissolved (µg/L)	Total (µg/L)	Non-Filtered Total Analysis (µg/L)	Filtered Dissolved Analysis (µg/L)
MD-S1	7.2	< 2	< 2	410	20	2J
MD-S2A	5	< 2	< 2	260	20	4J
MS-S2B	5.3					
MEAN	**5.8**	**-----**	**-----**	**335**	**20**	**3J**

J = Estimated Value (Reported Value > Detection Limit and < Reporting Limit).

NEBRASKA WATER QUALITY STANDARDS – Chromium III; Warmwater Aquatic Life Class A and Public Drinking Water

Constituent	Acute Standard (Dissolved)	Chronic Standard (Dissolved)	Public Drinking Water Standard
Chromium III *Hardness = 272 mg/L*	1,345 µg/L	175 µg/L	100 µg/L

Comparison of Chromium III Elutriate Tests to Water Quality Standards

The filtered elutriate tests (dissolved) for Chromium III were below the acute and chronic criteria for Aquatic Life Class A. The non-filtered elutriate tests (total) for Chromium III were below the Public Drinking Water standard.

The pre-elutriate samples for total Chromium could represent an "end-of-pipe" concern for total Chromium III regarding public drinking water. However, the Nebraska water quality standards state that Public Drinking Water use is for surface waters which serve as a public drinking water supply. These waters must be treated (e.g., coagulation, sedimentation, filtration, chlorination) before the water is suitable for human consumption. After treatment, these waters are suitable for drinking water, food processing, and similar uses. As indicated by the non-filtered and filtered elutriate testing, Chromium III levels (total and dissolved) are less than the 100 µg/L Public Drinking Water standard after settling and filtration. Significant dilution of the dredging discharge will immediately occur upon mixing with the Missouri River. There are no drinking water intakes in the immediate vicinity of the proposed dredging discharge at the Middle Decatur project site.

Comparison of Depth-Discrete Sediment/Soil Samples Collected at Site MD-S2

The depth-discrete sediment/soil samples had similar measured Chromium III levels.

4.3.1.9 *Metals – Copper*

Constituent: Metals – Copper						
		Receiving Water (Missouri River)		Pre-Elutriate Water	Elutriate Water	
Sample Location	Sediment/Soil (mg/kg)	Total (µg/L)	Dissolved (µg/L)	Total (µg/L)	Non-Filtered Total Analysis (µg/L)	Filtered Dissolved Analysis (µg/L)
MD-S1	5.1	6	5	380	10J	6J
MD-S2A	2.4	6	5	160	10J	6J
MS-S2B	2.5					
MEAN	**3.3**	**-----**	**-----**	**270**	**10J**	**6J**

J = Estimated Value (Reported Value > Detection Limit and < Reporting Limit).

NEBRASKA WATER QUALITY STANDARDS – Copper; Warmwater Aquatic Life Class A and Public Drinking Water

Constituent	Acute Standard (Dissolved)	Chronic Standard (Dissolved)	Public Drinking Water Standard (Secondary)
Copper *Hardness = 272 mg/L*	35 µg/L	21 µg/L	1,000 µg/L

Comparison of Copper Elutriate Tests to Water Quality Standards

The filtered elutriate tests (dissolved) for Copper were below the acute and chronic criteria for Aquatic Life Class A. The non-filtered elutriate tests (total) and pre-elutriate samples for Copper were below the Public Drinking Water secondary standard.

Comparison of Depth-Discrete Sediment/Soil Samples Collected at Site MD-S2

The depth-discrete sediment/soil samples had similar measured Copper levels.

4.3.1.10 Metals – Iron

Constituent: Metals - Iron						
		Receiving Water (Missouri River)		Pre-Elutriate Water	Elutriate Water	
Sample Location	Sediment/Soil (mg/kg)	Total (µg/L)	Dissolved (µg/L)	Total (µg/L)	Non-Filtered Total Analysis (µg/L)	Filtered Dissolved Analysis (µg/L)
MD-S1		1,520	10J	463,700	13,820	60J
MD-S2A		1,520	10J	246,300	13,140	10J
MS-S2B						
MEAN		**-----**	**-----**	**355,000**	**13,480**	**35**

J = Estimated Value (Reported Value > Detection Limit and < Reporting Limit).

NEBRASKA WATER QUALITY STANDARDS – Iron; Warmwater Aquatic Life Class A and Public Drinking Water

Constituent	Acute Standard (Dissolved)	Chronic Standard (Dissolved)	Public Drinking Water Standard (Secondary)
Iron	N/A	1,000 µg/L	300 µg/L

Comparison of Iron Elutriate Tests to Water Quality Standards

All filtered elutriate tests of the 2013 sediment/soil samples were less than the chronic Warmwater Aquatic Life Class A criterion for Iron. The non-filtered elutriate tests exceeded the 300 µg/L Public Drinking Water secondary standard. However, Nebraska's water quality standards qualify the application of numerical criteria for public drinking water as follows:

> *"If the natural background level of a parameter is greater than the numerical standard, this shall not in and of itself prohibit the use of the surface water. If the natural background level of a parameter is greater than the numerical standard listed below, the background level shall be used in place of the numerical criteria."*

Ambient water quality concentrations for total Iron in the Missouri River exceed the 300 µg/L public drinking water standard – the measured total Iron concentration of the collected receiving water was 1,520 µg/L. Significant dilution of the dredging discharge will immediately occur upon mixing with the Missouri River. There are no drinking water intakes in the immediate vicinity of the proposed dredging discharge at the Middle Decatur project site.

4.3.1.11 *Metals – Lead*

Constituent: Metals – Lead						
		Receiving Water (Missouri River)		Pre-Elutriate Water	Elutriate Water	
Sample Location	Sediment/Soil (mg/kg)	Total (µg/L)	Dissolved (µg/L)	Total (µg/L)	Non-Filtered Total Analysis (µg/L)	Filtered Dissolved Analysis (µg/L)
MD-S1	5.9	1	< 0.09	268	7.6	0.2J
MD-S2A	4.8	1	< 0.09	144	7.9	0.3J
MS-S2B	4.8					
MEAN	**5.2**	**-----**	**-----**	**206**	**7.8**	**0.3J**

J = Estimated Value (Reported Value > Detection Limit and < Reporting Limit).

NEBRASKA WATER QUALITY STANDARDS – Lead; Warmwater Aquatic Life Class A and Public Drinking Water

Constituent	Acute Standard (Dissolved)	Chronic Standard (Dissolved)	Public Drinking Water Standard
Lead *Hardness = 272 mg/L*	188 µg/L	7.3 µg/L	N/A

Comparison of Lead Elutriate Tests to Water Quality Standards

The filtered elutriate tests (dissolved) for Lead were below the acute and chronic criteria for Aquatic Life Class A.

Comparison of Depth-Discrete Sediment/Soil Samples Collected at Site MS-S2

The depth-discrete sediment/soil samples at site MD-S2 had the same measured Lead levels.

4.3.1.12 *Metals – Manganese*

Constituent: Metals - Manganese						
		Receiving Water (Missouri River)		Pre-Elutriate Water	Elutriate Water	
Sample Location	Sediment/Soil (mg/kg)	Total (µg/L)	Dissolved (µg/L)	Total (µg/L)	Non-Filtered Total Analysis (µg/L)	Filtered Dissolved Analysis (µg/L)
MD-S1		140	< 4	26,200	370	< 4
MD-S2A		140	< 4	8,420	320	< 4
MS-S2B						
MEAN		**-----**	**-----**	**17,310**	**345**	**< 4**

J = Estimated Value (Reported Value > Detection Limit and < Reporting Limit).

NEBRASKA WATER QUALITY STANDARDS – Manganese; Warmwater Aquatic Life Class A and Public Drinking Water

Constituent	Acute Standard (Dissolved)	Chronic Standard (Dissolved)	Public Drinking Water Standard (Secondary)
Manganese	N/A	1,000 µg/L	50 µg/L

Comparison of Manganese Elutriate Tests to Water Quality Standards

All filtered elutriate tests (dissolved) were less than the chronic Warmwater Aquatic Life Class A criterion for Manganese. The non-filtered elutriate tests exceeded the 50 µg/l Public Drinking Water secondary standard. However, Nebraska's water quality standards qualify the application of numerical criteria for public drinking water as follows:

> *"If the natural background level of a parameter is greater than the numerical standard, this shall not in and of itself prohibit the use of the surface water. If the natural background level of a parameter is greater than the numerical standard listed below, the background level shall be used in place of the numerical criteria."*

Ambient water quality concentrations for total Manganese in the Missouri River exceed the 50 µg/L public drinking water standard – the measured total Manganese concentration of the collected receiving water was 140 µg/L. Significant dilution of the dredging discharge will immediately occur upon mixing with the Missouri River. There are no drinking water intakes in the immediate vicinity of the proposed dredging discharge at the Middle Decatur project site.

4.3.1.13 *Metals – Mercury*

Constituent: Metals – Mercury						
		Receiving Water (Missouri River)		Pre-Elutriate Water	Elutriate Water	
Sample Location	Sediment/Soil (mg/kg)	Total (µg/L)	Dissolved (µg/L)	Total (µg/L)	Non-Filtered Total Analysis (µg/L)	Filtered Dissolved Analysis (µg/L)
MD-S1	0.006J	< 0.008	< 0.008	0.5	< 0.008	< 0.008
MD-S2A	0.007J	< 0.008	< 0.008	0.2J	0.01J	< 0.008
MS-S2B	0.009J					
MEAN	0.007J	-----	-----	0.4	< 0.008	< 0.008

J = Estimated Value (Reported Value > Detection Limit and < Reporting Limit).

NEBRASKA WATER QUALITY STANDARDS – Mercury; Warmwater Aquatic Life Class A and Public Drinking Water

Constituent	Acute Standard (Dissolved)	Chronic Standard (Total Recoverable)	Public Drinking water Standard
Mercury	1.40 µg/L	0.77 µg/L	2 µg/L

Comparison of Mercury Elutriate Tests to Water Quality Standards

The filtered elutriate tests (dissolved) for Mercury were non-detect and below the acute criterion and non-filtered elutriate analyses were below the chronic criterion for Aquatic Life Class A. The non-filtered elutriate tests (total) for Mercury were below the Public Drinking Water Standard.

Comparison of Depth-Discrete Sediment/Soil Samples Collected in 2013 at Site MD-S2

The depth discrete sediment/soil samples at site MD-S1had similar measured Mercury levels.

4.3.1.14 *Metals – Nickel*

Constituent: Metals – Nickel						
		Receiving Water (Missouri River)		Pre-Elutriate Water	Elutriate Water	
Sample Location	Sediment/Soil (mg/kg)	Total (µg/L)	Dissolved (µg/L)	Total (µg/L)	Non-Filtered Total Analysis (µg/L)	Filtered Dissolved Analysis (µg/L)
MD-S1	10.7	< 4	< 4	550	20J	< 4
MD-S2A	10.7	< 4	< 4	370	30	< 4
MS-S2B	10.5					
MEAN	**10.6**	**-----**	**-----**	**460**	**25**	**< 4**

J = Estimated Value (Reported Value > Detection Limit and < Reporting Limit).

NEBRASKA WATER QUALITY STANDARDS – Nickel; Warmwater Aquatic Life Class A and Public Drinking Water

Constituent	Acute Standard (Dissolved)	Chronic Standard (Dissolved)	Public Drinking Water Standard
Nickel *Hardness = 272 mg/L*	1,092 µg/L	121 µg/L	610 µg/L

Comparison of Nickel Elutriate Tests to Water Quality Standards

The filtered elutriate tests (dissolved) for Nickel were below the acute and chronic criteria for Aquatic Life Class A. The non-filtered elutriate tests (total) and pre-elutriate samples for Nickel were below the Public Drinking Water Standard.

Comparison of Depth-Discrete Sediment/Soil Samples Collected at Site MD-S2

The depth discrete sediment/soil samples at site MD-S2 had similar measured Nickel levels.

4.3.1.15 *Metals – Selenium*

Constituent: Metals - Selenium						
		Receiving Water (Missouri River)		Pre-Elutriate Water	Elutriate Water	
Sample Location	Sediment/Soil (mg/kg)	Total (µg/L)	Dissolved (µg/L)	Total (µg/L)	Non-Filtered Total Analysis (µg/L)	Filtered Dissolved Analysis (µg/L)
MD-S1		3	2	23	4	3
MD-S2A		3	2	13	3	3
MS-S2B						
MEAN		**-----**	**-----**	**18**	**3.5**	**3.0**

J = Estimated Value (Reported Value > Detection Limit and < Reporting Limit).

NEBRASKA WATER QUALITY STANDARDS – Selenium; Warmwater Aquatic Life Class A, Public Drinking Water and Agricultural Class A

Constituent	Acute Standard (Total Recoverable)	Chronic Standard (Total Recoverable)	Public Drinking Water Standard	Agricultural
Selenium	20 µg/L	5.0 µg/L	50 µg/L	20 µg/L

Comparison of Selenium Elutriate Tests to Water Quality Standards

All non-filtered (total) and filtered (dissolved) elutriate tests for Selenium were below the acute and chronic criteria for Aquatic Life Class A, Public Drinking Water, and Agricultural Class A.

The pre-elutriate (total) samples for total Selenium could represent an “end-of-pipe” concern for total Selenium regarding the chronic Warmwater Aquatic Life criterion. However, significant dilution of the dredging discharge will immediately occur upon mixing with the Missouri River.

4.3.1.16 *Metals – Silver*

Constituent: Metals - Silver						
		Receiving Water (Missouri River)		Pre-Elutriate Water	Elutriate Water	
Sample Location	Sediment/Soil (mg/kg)	Total (µg/L)	Dissolved (µg/L)	Total (µg/L)	Non-Filtered Total Analysis (µg/L)	Filtered Dissolved Analysis (µg/L)
MD-S1		< 4	4J	< 4	< 4	< 4
MD-S2A		< 4	4J	5J	< 4	< 4
MS-S2B						
MEAN		-----	-----	**< 4**	**< 4**	**< 4**

J = Estimated Value (Reported Value > Detection Limit and < Reporting Limit).

NEBRASKA WATER QUALITY STANDARDS – Silver; Warmwater Aquatic Life Class A and Public Drinking Water

Constituent	Acute Standard (Dissolved)	Chronic Standard (Dissolved)	Public Drinking Water Standard (Secondary)
Silver *Hardness = 272 mg/L*	19 µg/L	N/A	100 µg/L

Comparison of Silver Elutriate Tests to Water Quality Standards

The pre-elutriate samples and non-filtered and filtered elutriate tests were all below the Silver acute criterion for Warmwater Aquatic Life Class A and the Public Drinking Water standard.

4.3.1.17 *Metals – Thallium*

Constituent: Metals - Thallium						
		Receiving Water (Missouri River)		Pre-Elutriate Water	Elutriate Water	
Sample Location	Sediment/Soil (mg/kg)	Total (µg/L)	Dissolved (µg/L)	Total (µg/L)	Non-Filtered Total Analysis (µg/L)	Filtered Dissolved Analysis (µg/L)
MD-S1		< 0.005	< 0.005	6.2	< 0.005	< 0.005
MD-S2A		< 0.005	< 0.005	2.3	< 0.005	< 0.005
MS-S2B						
MEAN		-----	-----	4.3	< 0.005	< 0.005

J = Estimated Value (Reported Value > Detection Limit and < Reporting Limit).

NEBRASKA WATER QUALITY STANDARDS – Thallium; Warmwater Aquatic Life Class A and Public Drinking Water

Constituent	Acute Standard (Dissolved)	Chronic Standard (Dissolved)	Public Drinking Water Standard
Thallium	1,400 µg/L	0.47 µg/L	0.24µg/L

Comparison of Thallium Elutriate Tests to Water Quality Standards

The filtered elutriate tests (dissolved) for Thallium were below the acute and chronic criteria for Aquatic Life Class A. The non-filtered elutriate tests (total) for Thallium were below the Public Drinking Water Standard.

The pre-elutriate samples for total Thallium were elevated. This could represent an "end-of-pipe" concern for total Thallium regarding public drinking water. However, the Nebraska water quality standards state that Public Drinking Water use is for surface waters which serve as a public drinking water supply. These waters must be treated (e.g., coagulation, sedimentation, filtration, chlorination) before the water is suitable for human consumption. After treatment, these waters are suitable for drinking water, food processing, and similar uses. As indicated by the non-filtered and filtered elutriate testing, Thallium levels (total and dissolved) are less than the 0.24 µg/L Public Drinking Water standard after settling and filtration. Significant dilution of the dredging discharge will immediately occur upon mixing with the Missouri River. There are no drinking water intakes in the immediate vicinity of the proposed dredging discharge at the Middle Decatur project site.

4.3.1.18 *Metals – Zinc*

Constituent: Metals – Zinc						
		Receiving Water (Missouri River)		Pre-Elutriate Water	Elutriate Water	
Sample Location	Sediment/Soil (mg/kg)	Total (µg/L)	Dissolved (µg/L)	Total (µg/L)	Non-Filtered Total Analysis (µg/L)	Filtered Dissolved Analysis (µg/L)
MD-S1	26.7	20J	10J	1,550	80	10J
MD-S2A	20.1	20J	10J	690	80	8J
MS-S2B	20.0					
MEAN	**22.7**	**-----**	**-----**	**1,120**	**80**	**9J**

J = Estimated Value (Reported Value > Detection Limit and < Reporting Limit).

NEBRASKA WATER QUALITY STANDARDS – Zinc; Warmwater Aquatic Life Class A and Public Drinking Water

Constituent	Acute Standard (Dissolved)	Chronic Standard (Dissolved)	Public Drinking Water Standard (Secondary)
Zinc *Hardness = 272 mg/L*	274 µg/L	274 µg/L	5,000 µg/L

Comparison of Zinc Elutriate Tests to Water Quality Standards

The filtered elutriate tests (dissolved) for Zinc were below the acute and chronic criteria for Aquatic Life Class A. The non-filtered elutriate tests (total) and pre-elutriate samples for Zinc were below the Public Drinking Water Standard.

Comparison of Depth-Discrete Sediment/Soil Samples Collected in 2013 at Site IC-S1

The depth discrete sediment/soil samples at site MD-S2 had similar measured Zinc levels.

4.3.1.19 *Nitrate-Nitrite Nitrogen*

Constituent: Nitrate-Nitrite Nitrogen						
		Receiving Water (Missouri River)		Pre-Elutriate Water	Elutriate Water	
Sample Location	Sediment/Soil (mg/kg)	Total (mg/L)	Dissolved (mg/L)	Total (mg/L)	Non-Filtered Total Analysis (mg/L)	Filtered Dissolved Analysis (mg/L)
MD-S1	0.5J		0.53	1.40		0.70
MD-S2A	< 0.04		0.53	0.67		0.60
MS-S2B	3.9					
MEAN	**1.47**		**-----**	**1.04**		**0.65**

J = Estimated Value (Reported Value > Detection Limit and < Reporting Limit).

NEBRASKA WATER QUALITY STANDARDS – Nitrate-Nitrite Nitrogen; Agricultural Class A and Public Drinking Water

Constituent	Acute Standard	Chronic Standard	Agricultural	Public Drinking Water Standard
Nitrate-Nitrite Nitrogen	N/A	N/A	100 mg/L	10 mg/L

Comparison of Nitrate-Nitrite Nitrogen Elutriate Tests to Water Quality Standards

All pre-elutriate samples and filtered elutriate tests were less than the Nebraska Agricultural Class A and Public Drinking Water standard for Nitrate-Nitrite Nitrogen.

Comparison of Depth-Discrete Sediment/Soil Samples Collected Site MD-S2

The depth-discrete sediment/soil samples had appreciably different measured Nitrate-Nitrite Nitrogen levels at site MD-S2.

4.3.1.20 *Organochlorine Pesticide Scan*

Constituent: Organochlorine Pesticide Scan						
		Receiving Water (Missouri River)		Pre-Elutriate Water	Elutriate Water	
Sample Location	Sediment/Soil (mg/kg)	Total (µg/L)	Dissolved (µg/L)	Total (µg/L)	Non-Filtered Total Analysis (µg/L)	Filtered Dissolved Analysis (µg/L)
MD-S1	n.d.	n.d.			n.d.	
MD-S2A	n.d.	n.d.			n.d.	
MS-S2B	n.d.	n.d.			n.d.	

n.d. = Non-detect.

Detection and Reporting Limits – Organochlorine Pesticide Scan:

21 different pesticides were analyzed with varying detection and reporting levels – see Attachment 3.

Nebraska Water Quality Standards – Organochlorine Pesticides; Warmwater Aquatic Life Class A and Human Health (Fish Consumption)

Organochlorine Pesticide	Acute Standard (µg/L)	Chronic Standard (µg/L)	Human Health Criterion (µg/L)
Aldrin	3	0.0005	0.0005
BHC	100	0.414	0.414
BHC (Alpha)	-----	0.049	0.049
BHC (Beta)	-----	0.17	0.17
Chlordane	2.4	0.0043	-----
DDT	1.1	0.001	-----
DDD	0.6	0.0031	0.0031
DDE	1,050	0.0022	0.0022
Dieldrin	0.24	0.00054	0.00054
Endosulfan (Alpha)	0.22	0.056	-----
Endosulfan (Beta)	0.22	0.056	-----
Endosulfan sulfate	-----	89	89
Endrin	0.086	0.036	-----
Endrin aldehyde	-----	0.30	0.30
Heptachlor	0.52	0.00079	0.00079
Heptachlor epoxide	0.52	0.00039	0.00039
Lindane	0.95	0.16	-----
Methoxychlor	-----	0.03	40
Toxaphene	0.73	0.002	0.0028

Comparison of Organochlorine Pesticide Scan Elutriate Tests to Water Quality Standards

All elutriate tests of the collected sediment/soil samples were non-detectable for the Organochlorine Pesticides included in the Scan. Some of Nebraska's water quality standards for the scanned pesticides were below the detection limits of the scan.

4.3.1.21 *Polychlorinated Biphenyls (PCBs) Scan*

Constituent: Polychlorinated Biphenyls						
		Receiving Water (Missouri River)		Pre-Elutriate Water	Elutriate Water	
Sample Location	Sediment/Soil (mg/kg)	Total (µg/L)	Dissolved (µg/L)	Total (µg/L)	Non-Filtered Total Analysis (µg/L)	Filtered Dissolved Analysis (µg/L)
MD-S1	n.d.	n.d.			n.d.	
MD-S2A	n.d.	n.d.			n.d.	
MS-S2B	n.d.	n.d.			n.d.	

n.d. = Non-detect.

Detection and Reporting Limits – PCB Scan:

Varies by PCB congener – see Attachment 3.

Nebraska Water Quality Standards – PCBs; Warmwater Aquatic Life Class A and Human Health – Fish Consumption

Constituent	Acute Standard	Chronic Standard	Human Health Criterion
Polychlorinated Biphenyls	2.0 µg/L	0.00064 µg/L	0.00064 µg/L

Comparison of PCBs Scan Elutriate Tests to Water Quality Standards

All elutriate tests of the collected sediment/soil samples were non-detectable for the PCBs included in the Scan. Some of Nebraska's water quality standards for the scanned PCBs were below the detection limits of the scan.

4.3.1.22 *pH*

Constituent: pH						
		Receiving Water (Missouri River)		Pre-Elutriate Water	Elutriate Water	
Sample Location	Sediment/Soil (S.U.)	Field (S.U.)	Lab (S.U.)	Lab (S.U.)	Non-Filtered Total Analysis (S.U.)	Filtered Dissolved Analysis (S.U.)
MD-S1	7.8	8.1	8.3	7.7	8.2	
MD-S2A	8.2	8.1	8.3	8.1	8.2	
MS-S2B	8.2					

Detection and Reporting Limits – pH: Sediment/Soil and Water = 0.1 S.U. and 0.2 S.U.

Nebraska Water Quality Standards – pH; Warmwater Aquatic Life Class A

Constituent	Minimum Standard	Maximum Standard
pH	6.5 S.U.	9.0 S.U.

Comparison of pH Elutriate Tests to Water Quality Standards

The pH of all pre-elutriate and elutriate tests of the collected sediment/soil samples were within the minimum and maximum pH criteria.

4.3.2 Analyzed Constituents with No Promulgated State Water Quality Standards

The following constituents were analyzed and have no water quality standards numeric criteria promulgated by the State of Iowa or Nebraska:

- Carbonaceous Biochemical Oxygen Demand, 5-Day ($CBOD_5$)
- Chemical Oxygen Demand (COD)
- Kjeldahl Nitrogen, Total (TKN)
- Percent Solids
- Total Organic Carbon (TOC)
- Total Phosphorus
- Total Suspended Solids
- Turbidity

4.3.2.1 *Carbonaceous Biochemical Oxygen Demand (5-day)*

Constituent: Carbonaceous Biochemical Oxygen Demand (5-Day)						
		Receiving Water (Missouri River)		**Pre-Elutriate Water**	**Elutriate Water**	
Sample Location	**Sediment/Soil (mg/kg)**	**Total (mg/L)**	**Dissolved (mg/L)**	**Total (mg/L)**	**Non-Filtered Total Analysis (mg/L)**	**Filtered Dissolved Analysis (mg/L)**
MD-S1		2J		6	1J	
MD-S2A		2J		1J	1J	
MS-S2B						
MEAN		**-----**		**3.5**	**1J**	

J = Estimated Value (Reported Value > Detection Limit and < Reporting Limit).

4.3.2.2 *Chemical Oxygen Demand*

Constituent: Chemical Oxygen Demand						
		Receiving Water (Missouri River)		**Pre-Elutriate Water**	**Elutriate Water**	
Sample Location	**Sediment/Soil (mg/kg)**	**Total (mg/L)**	**Dissolved (mg/L)**	**Total (mg/L)**	**Non-Filtered Total Analysis (mg/L)**	**Filtered Dissolved Analysis (mg/L)**
MD-S1		11		516	16	
MD-S2A		11		46	12	
MS-S2B						
MEAN		**-----**		**281**	**14**	

4.3.2.3 *Total Kjeldahl Nitrogen*

Constituent: Total Kjeldahl Nitrogen						
		Receiving Water (Missouri River)		Pre-Elutriate Water	Elutriate Water	
Sample Location	Sediment/Soil (mg/kg)	Total (mg/L)	Dissolved (mg/L)	Total (mg/L)	Non-Filtered Total Analysis (mg/L)	Filtered Dissolved Analysis (mg/L)
MD-S1	180	0.42		23.10	1.69	
MD-S2A	100	0.42		6.52	0.54	
MS-S2B	82					
MEAN	**121**	**-----**		**14.81**	**1.12**	

Comparison of Depth-Discrete Sediment/Soil Samples Collected in 2013 at Site IC-S1

The depth discrete sediment/soil samples at site MD-S2 had similar measured Total Kjeldahl Nitrogen levels.

4.3.2.4 *Percent Solids*

Constituent: Percent Solids						
Sample Location	Sediment/Soil (%)					
MD-S1	92.3					
MD-S2A	94.6					
MS-S2B	94.9					
MEAN	**93.9**					

Comparison of Depth-Discrete Sediment/Soil Samples Collected at Site MD-S2

The depth discrete sediment/soil samples collected at site MD-S2 had similar measured Percent Solids levels.

4.3.2.5 *Total Organic Carbon*

Constituent: Total Organic Carbon						
		Receiving Water (Missouri River)		Pre-Elutriate Water	Elutriate Water	
Sample Location	Sediment/Soil (mg/kg)	Total (mg/L)	Dissolved (mg/L)	Total (mg/L)	Non-Filtered Total Analysis (mg/L)	Filtered Dissolved Analysis (mg/L)
MD-S1	5,200	4.8		347	8.6	
MD-S2A	2,000	4.8		149	7.2	
MS-S2B	1,400					
MEAN	**2,867**	**-----**		**248**	**7.9**	

Comparison of Depth-Discrete Sediment/Soil Samples at Site MD-S2

The shallower sediment/soil sample collected at site MD-S2 had a higher measured Total Organic Carbon level than the deeper sediment/soil sample.

4.3.2.6 *Phosphorus*

Constituent: Phosphorus						
		Receiving Water (Missouri River)		Pre-Elutriate Water	Elutriate Water	
Sample Location	Sediment/Soil (mg/kg)	Total (mg/L)	Dissolved (mg/L)	Total (mg/L)	Non-Filtered Total Analysis (mg/L)	Filtered Dissolved Analysis (mg/L)
MD-S1	406	0.11	0.03J	15.90	0.36	0.01J
MD-S2A	303	0.11	0.03J	5.64	0.33	0.03J
MS-S2B	293					
MEAN	**334**	**-----**	**-----**	**10.77**	**0.35**	**0.02J**

J = Estimated Value (Reported Value > Detection Limit and < Reporting Limit).

Comparison of Depth-Discrete Sediment/Soil Samples Collected in 2013 at Site IC-S1

The depth discrete sediment/soil samples collected at site MD-S2 had similar measured Total Phosphorus levels.

4.3.2.7 *Total Suspended Solids*

Constituent: Total Suspended Solids						
		Receiving Water (Missouri River)		Pre-Elutriate Water	Elutriate Water	
Sample Location	Sediment/Soil (mg/kg)	Total (mg/L)	Dissolved (mg/L)	Total (mg/L)	Non-Filtered Total Analysis (mg/L)	Filtered Dissolved Analysis (mg/L)
MD-S1		67		21,900	267	
MD-S2A		67		6,230	189	
MS-S2B						
MEAN		**-----**		**14,065**	**228**	

4.3.2.8 *Turbidity*

Constituent: Turbidity						
		Receiving Water (Missouri River)		Pre-Elutriate Water	Elutriate Water	
Sample Location	Sediment/Soil	Total (NTU)	Dissolved (NTU)	Total (NTU)	Non-Filtered Total Analysis (mg/L)	Filtered Dissolved Analysis (mg/L)
MD-S1		30		6,750	381	< 1
MD-S2A		30		2,850	292	< 1
MS-S2B						
MEAN		**-----**		**4,800**	**337**	**< 1**

5 WATER QUALITY FACTUAL DETERMINATIONS

5.1 Physical Substrate Determinations

Table 4 and Figure 5 described the particle size composition of the material identified for excavation for the construction of SWH at the proposed Middle Decatur project site. A mean particle size composition for the material identified for excavation at the proposed project site was calculated from the three collected sediment/soil samples. The sediment/soil to be excavated is believed to be sandy alluvial material.

As part of Bank Stabilization and Navigation Project (BSNP), the Omaha District irregularly samples substrate composition in the navigation channel of the Missouri River. In 2008, particle size composition of the river bottom was measured at sites along the river. At each location two to three substrate samples were collected from the navigation channel. Table 5 shows the particle size composition of the substrate samples collected from the navigation channel upstream and downstream of the proposed Middle Decatur project site (RM689) at RM690 and RM685. The substrate particle size composition in the navigation channel of the Missouri River indicates that the finer material has been washed out and transported downstream. This is in line with the management goals of the BSNP to maintain the navigation channel.

Table 5. Summary of particle size analysis of the sediment samples collected from the Missouri River navigation channel at RM690 and RM685 during 2008.

		% Gravel		% Sand			% Fines	
Sample Location	% Cobbles	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
RM690 - 70151	0.0	0.0	0.0	0.1	47.7	51.9	0.3	
RM690 - 70152	0.0	0.0	0.0	1.9	41.2	56.3	0.6	
RM690 - 70153	0.0	0.0	0.2	0.0	51.2	48.3	0.0	
MEAN RM690	**0.0**	**0.0**	**0.1**	**0.7**	**46.7**	**52.2**	**0.3**	
RM685 - 70154	0.0	0.0	3.8	10.9	65.9	19.1	0.3	
RM685 - 70155	0.0	0.0	0.3	1.5	50.4	47.8	0.0	
RM685 - 70156	0.0	0.0	0.0	0.1	38.5	61.3	0.1	
MEAN RM685	**0.0**	**0.0**	**1.4**	**4.2**	**51.6**	**42.7**	**0.1**	

Figure 6 plots the mean particle size composition of the sediment/soil samples collected at the proposed Middle Decatur project site and from the navigation channel of the Missouri River at RM690 and RM685. As seen in Figure 6, the sediment identified for excavation at the proposed Middle Decatur project site as compared to the bottom substrate of the Missouri River navigation channel has a few more fines, but is very similar. This is not unexpected given that the existing sediment to be dredged at the proposed project site is in a "chute" area and is believed to have been recently deposited during the 2011 Missouri River flooding. As occurs with sediment delivered from inflowing tributaries, the finer material in the proposed dredging discharge will be transported downstream as part of the suspended solids load, and any heavier material will be incorporated into the Missouri River bed-load.

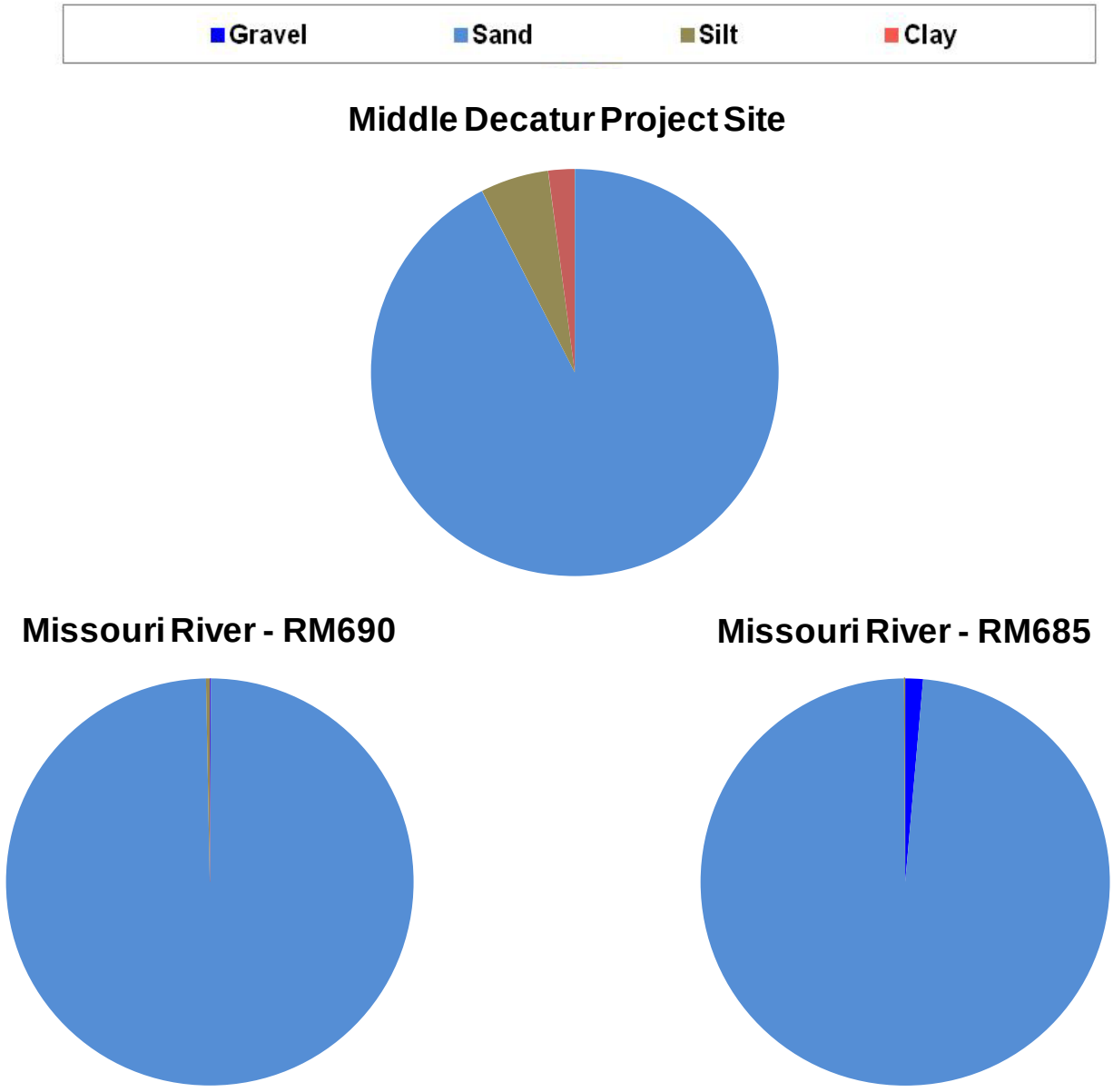


Figure 6. Particle size composition of likely dredge material at the proposed Middle Decatur project site and the substrate of the Missouri River bottom in the navigation channel in the area of the proposed project.

5.2 Suspended Particulate/Turbidity Determinations

The dredge slurry discharge at the "end-of-pipe" will have a high total suspended solids (TSS) concentration and be quite turbid. Table 6 provides the TSS and turbidity levels measured in the pre-elutriate samples prepared from sediment/soil samples collected at the proposed Middle Decatur project site. Some local impacts to existing Missouri River water quality from TSS and turbidity can be expected in the immediate vicinity of the dredging discharge.

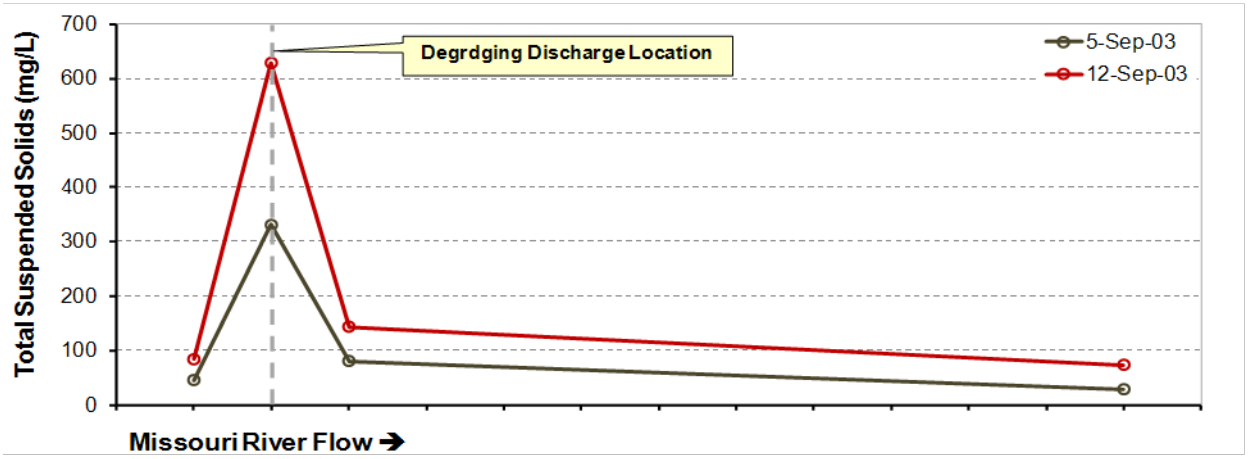
Table 6. Total suspended solids and turbidity levels measured in pre-elutriate samples prepared from sediment/soil samples collected at the proposed Middle Decatur project site.

Sediment/Soil Sample	Total Suspended Solids (mg/L)	Turbidity (NTU)
MD-S1	21,900	267
MD-S2	6,230	189
MEAN	**14,065**	**226**

Past dredging discharges to construct SWH have attempted to minimize any such impacts by targeted placement of the dredging discharge in the Missouri River (e.g. mid-channel, mid-depth, etc.). The Omaha District assessed in-river TSS and turbidity levels upstream and downstream of the dredging discharge during construction of SWH at the California Bend project site. Four sites were monitored: 1) upstream of the "end-of-pipe", 2) zone of initial dilution at the dredging discharge, 3) 200 feet downstream of the "end-of-pipe" in the discharge plume, and 4) 2,000 feet downstream of the "end-of-pipe in the discharge plume. Table 7 gives TSS and turbidity levels measured at the four locations during dredging discharge in September 2003. Figure 7 plots the same information. As seen in Table 7 and Figure 7, TSS and turbidity levels are elevated in the zone of initial dilution; however, these levels quickly dissipate downstream in the discharge plume.

Table 7. Total suspended solids and turbidity levels monitored in the Missouri River upstream and downstream of the dredging discharge to construct shallow-water habitat at the California Bend project site in 2003.

	Upstream of Discharge		Zone of Initial Dilution		200 Feet Downstream		2,000 Feet Downstream	
Date	TSS (mg/L)	Turbidity (NTUs)	TSS (mg/L)	Turbidity (NTUs)	TSS (mg/L)	Turbidity (NTUs)	TSS (mg/L)	Turbidity (NTUs)
5-Sep-03	46	30	331	218	81	90	29	38
12-Sep-03	84	43	629	414	144	94	74	56



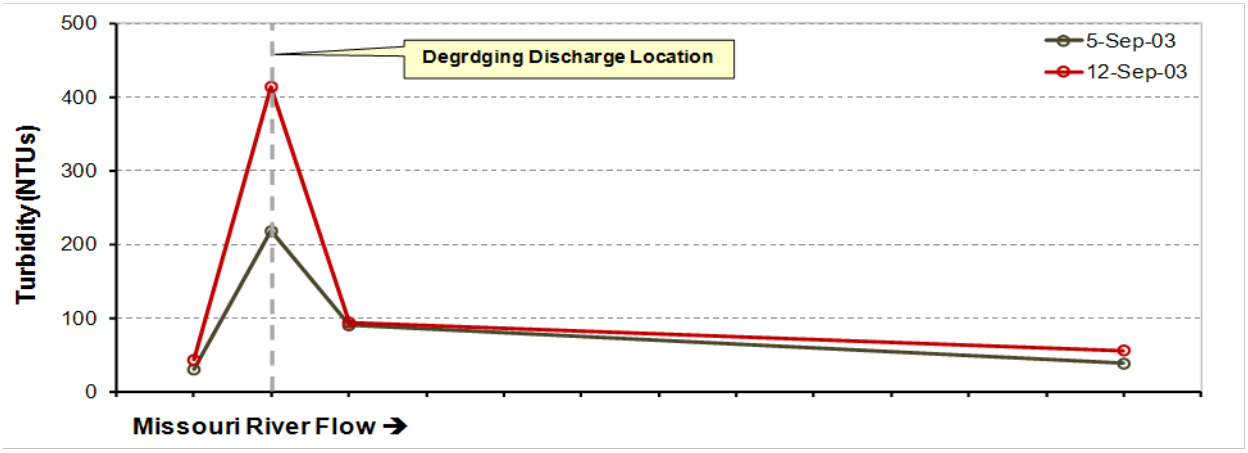


Figure 7. Total suspended solids and turbidity levels monitored in the Missouri River upstream and downstream of the dredging discharge to construct shallow-water habitat at the California Bend project in 2003.

5.3 Contaminant Determinations

5.3.1 Constituents with Promulgated State Water Quality Standards' Criteria

Elutriate testing of representative sediment/soil samples collected at the proposed Middle Decatur project included analysis for the following constituents that the State of Nebraska has promulgated water quality standards criteria: Ammonia; Atrazine; Metals: Aluminum, Antimony, Arsenic, Beryllium, Cadmium, Chromium III, Copper, Iron, Lead, Manganese, Mercury, Nickel, Selenium, Silver, Thallium, Zinc; Nitrate-Nitrite Nitrogen; Organochlorine Pesticides; PCBs; and pH. With the exception of Aluminum, none of the prepared elutriate samples exceeded promulgated Nebraska water quality standards criteria. One filtered elutriate tests for Aluminum exceeded the chronic criterion for Warmwater Aquatic Life Class, but was below the acute criterion.

The prepared pre-elutriate samples exhibited elevated concentrations, as total, for several metals. This could represent an "end-of-pipe" concern for these metals regarding public drinking water which has metals criteria based on total metals concentrations. However, the Nebraska water quality standards state

that Public Drinking Water use is for surface waters which serve as a public drinking water supply. These waters must be treated (e.g., coagulation, sedimentation, filtration, chlorination) before the water is suitable for human consumption. After treatment, these waters are suitable for drinking water, food processing, and similar uses. As indicated by the non-filtered and filtered elutriate testing, all metals concentrations, except iron and manganese (secondary standards) were below Public Drinking Water standards after settling and filtration. Also, significant dilution of the dredging discharge "end-of-pipe" concentrations will immediately occur upon mixing with the Missouri River. There are no drinking water intakes in the immediate vicinity of the proposed dredging discharge at the Middle Decatur project site

5.3.2 Nutrients

Table 8 summarizes the nutrient analyses of sediment/soil samples collected at the proposed Middle Decatur project site, and pre-elutriate and elutriate samples prepared from the collected sediment/soil samples. Pre-elutriate samples characterize total nutrients (i.e. settlable, suspended, and dissolved) in the prepared 1:4 (sediment to receiving water) mixture. Non-filtered elutriate samples characterize suspended and dissolved nutrients remaining in the mixture supernatant after 1-hour of settling. Filtered elutriate samples characterize dissolved nutrients in the supernatant of the settled mixture. Pre-elutriate samples represent potential "end-of-pipe" nutrient concentrations of the slurry discharge prior to any mixing with the receiving water (i.e. Missouri River). Pre-elutriate samples were analyzed for Total Kjeldahl Nitrogen, Ammonia Nitrogen, Nitrate/Nitrite Nitrogen, and Total Phosphorus. Non-filtered elutriate samples were analyzed for Total Kjeldahl Nitrogen, Total Ammonia Nitrogen, and Total Phosphorus. Standard, filtered elutriate samples were analyzed for dissolved Nitrate-Nitrite Nitrogen and dissolved Phosphorus.

Table 8. Summary of nutrient analyses of sediment/soil samples collected at the proposed Middle Decatur shallow-water habitat site and pre-elutriate and elutriate testing of the collected sediment/soil samples.

	Total Kjeldahl N (mg/L)	**Ammonia N (mg/L)**	**Nitrate-Nitrite N (mg/L)**	**Phosphorus (mg/L)**
Site MD-S1:				
Sediment/Soil	180*	3.4*	0.5*	406*
Pre-Elutriate	23.1	< 0.1	1.40	15.90
Non-Filtered Elutriate	1.7	0.63	-----	0.36
Dissolved Elutriate	-----	0.63	0.70	0.01
Site MD-S2A:				
Sediment/Soil	100*	1.3*	< 0.04*	303*
Pre-Elutriate	6.5	< 0.1	0.67	5.64
Non-Filtered Elutriate	0.5	0.04	-----	0.33
Dissolved Elutriate	-----	0.03	0.60	0.03
Site MD-S2B:				
Sediment/Soil	82*	1.4*	3.9*	293*
Mean Concentration				
Sediment/Soil	**121***	**2.0***	**1.47***	**334***
Pre-Elutriate	**14.8**	**< 0.1**	**1.04**	**10.77**
Non-Filtered Elutriate	**1.1**	**0.34**	**-----**	**0.35**
Dissolved Elutriate	**-----**	**0.33**	**0.65**	**0.02**

* mg/kg

5.3.2.1 Estimated Total Tonnage of Nutrients to be Discharged to the Missouri River

It is estimated that that a total of 300,000 cubic yards of material would be excavated and discharged to the Missouri River to construct SWH at the proposed Middle Decatur project. Table 4 and Figure 5 describe the particle size composition of the material proposed for excavation. Based on the alluvial material to be excavated, a conversion factor of 95 lbs/ft^3 was used to convert the estimated material volume (300,000 yd^3) to estimated material weight (349,043 tons). The metric tonnage of nutrients that would be discharged to the Missouri River during the period of SWH construction was estimated from the mean nutrient levels determined for the collected sediment/soil samples and the total material to be excavated (Table 9). Currently, the total phosphorus load to the Gulf of Mexico is estimated to be 154,300 metric tons per year, with the contribution of the Missouri River to this total load estimated to be between 16.8% and 20% (NRC, 2011). If the proposed SWH construction at Middle Decatur was completed within one year and the estimated total discharge of 139.08 metric tons of total phosphorus made it to the Gulf of Mexico in one year, it would represent 0.41% of the annual Missouri River total phosphorus load delivered to the Mississippi River, and 0.07% of the annual total phosphorus load delivered to the Gulf of Mexico. These percentages are upper bound estimates, as sediment deposition processes in the Missouri and Mississippi River channels would reduce loads delivered to the Gulf, and actual downstream deliveries would be significantly less than these values.

Table 9. Estimated metric tonnage of nutrients that would be discharged to the Missouri River during the entire period shallow-water habitat was constructed at the proposed Middle Decatur project.

Total Kjeldahl Nitrogen (metric tons)	Ammonia (metric tons)	Nitrate-Nitrite Nitrogen (metric tons)	Total Phosphorus (metric tons)
42.23	0.70	0.51	116.58

Note: 1 metric ton = 1,000 kg = 2,205 lbs.

5.3.2.2 Potential Impacts to Missouri River Water Quality

5.3.2.2.1 Dredging Discharge Flows

The following information was taken from EM 1110-2-5025 (25-Mar-1983), "*Dredging and Dredged material Disposal*" (USACE, 1983):

> "The hydraulic pipeline cutterhead suction dredge … is equipped with a rotating cutter apparatus surrounding the intake end of the suction pipe, it can effectively dig and pump all types of alluvial materials and compacted deposits, such as clay and hardpan. Slurries of 10 to 20 percent solids (by dry weight) are typical, depending upon the material being dredged, dredging depth, horsepower of dredge pumps, and pumping distance to disposal area. If no other data are available, a pipeline discharge concentration of 13 percent by dry weight (145 ppt) should be used for design purposes. Pipeline discharge velocity, under routine working conditions, ranges from 15-20 ft/sec. Table 10 presents theoretical pipeline discharge rates as functions of pipeline discharge velocity for dredges ranging from 8 to 30 in."

Table 10. Suction dredge pipeline discharge rates (cfs)[(a)] [taken from EM 1110-2-5025].

	Discharge Pipe Diameter			
Discharge Velocity (ft/sec)	**8-inch**	**18-inch**	**24-inch**	**30-inch**
10	3.5	17.7	31.4	49.1
15	5.2	26.5	47.1	73.6
20	7.0	35.3	62.8	98.1
25	8.7	44.2	78.5	122.7

(a) Discharge rate = pipeline area x discharge velocity.
Discharge rate for 20-inch diameter pipe:
Pipe radius = 10 in. = 0.833 ft.
Pipe area = $\pi r^2 = (3.1416)(0.833)^2 = 2.18$ ft^2
Discharge rate = 2.18 ft^2 x 20 ft/sec = 43.6 cfs
Note: Given a velocity of 20 ft/sec was used, this is a maximum estimate for discharge rate.

5.3.2.2.2 Elutriate Testing of Sediment/Soil Samples Collected at the Middle Decatur Site

Elutriate testing of the sediment/soil samples collected at the proposed Middle Decatur project site was done pursuant to the "*Inland Testing Manual"*. A test slurry was prepared based on a dilution of 1 part sediment to 4 parts receiving water on a volume basis. The 1:4 dilution for elutriate testing represents a 20% slurry. However, elutriate testing is done using "wet" sediment to avoid volatilization of any potential contaminants in the sediment during a drying process. The "wet" sediment was analyzed for percent solids and the amount of water present in the sediment sample can be mathematically converted to "dry weight" based on the percent solids quantification. Table 11estimates the dry-weight percent slurries for each of the elutriate mixtures prepared from the sediment/soil samples collected at the proposed project site. The percent slurry estimate is based on the measured percent solids of the collected sediment/soil samples and the 1:4 dilution used to prepare elutriate samples. All of the prepared elutriate mixtures from the collected sediment/soil samples fall within the 10 to 20 percent solids (by dry weight) typical for a hydraulic pipeline cutterhead suction dredge (Table 11).

Table 11. Dry-weight percent slurries represented by the elutriate mixtures prepared from the sediment/soil samples collected at the proposed Middle Decatur shallow-water habitat site.

Sediment/Soil Sample	**Percent Solids**	**Percent Slurry (Based on Estimated Dry Weight)**
MD-S1	92.3%	18.5%
MD-S2	94.6%	18.9%

Note: Based on a 1:4 (dry-weight sediment to water ratio):
- 100% percent solids = 20% slurry
- 50% percent solids = 10% slurry

5.3.2.2.3 Missouri River Nutrient Conditions at Middle Decatur Area on 3-May-2011

Table 12, Table 13, and Table 14, respectively, summarize the nutrient concentrations, fluxes, and loadings present in the Missouri River on 26-Apr-2013 when sediment/soil samples were collected at the proposed Middle Decatur project site.

Table 12. Nutrient concentrations measured in the Missouri River at RM689 on 26-Apr-2013.

Total Kjeldahl N (mg/L)	**Ammonia N (mg/L)**	**Nitrate-Nitrite N (mg/L)**	**Total P (mg/L)**	**Dissolved P (mg/L)**
0.42	0.06	0.53	0.11	0.03

Table 13. Estimated nutrient fluxes in the Missouri River at RM689 on 26-Apr-2013 based on measured nutrient concentrations and recorded mean daily flow of 17,700 cfs.

Flow (cfs)	Total Kjeldahl N (kg/sec)	Ammonia N (kg/sec)	Nitrate-Nitrite N (kg/sec)	Total P (kg/sec)	Dissolved P (kg/sec)
17,700	0.2105	0.0301	0.2656	0.0551	0.0150

Table 14. Estimated daily nutrient loadings in the Missouri River at RM689 on 26-Apr-2013 based on estimated nutrient fluxes.

Flow (cfs)	Total Kjeldahl N (tons/day)	Ammonia N (tons/day)	Nitrate-Nitrite N (tons/day)	Total P (tons/day)	Dissolved P (tons/day)
17,700	20.05	2.86	25.30	5.25	1.43

5.3.2.2.4 Missouri River Mean Nutrient Conditions at Decatur (RM691) and Rulo (RM498) Nebraska

Mean nutrient conditions were determined for the Missouri River at Decatur (RM691) and Rulo (RM498) Nebraska from monthly water quality sampling of the river by the District at the two sites over the 10-year period 2003 through 2012 (Table 15). The Decatur site represents conditions of the Missouri River in the area of the proposed Middle Decatur project, and the Rulo site the conditions of the Missouri River as it leaves the District.

Table 15. Long-term mean nutrient concentrations measured in the Missouri River at Decatur (RM691) and Rulo (RM498) Nebraska by the Omaha District over the 10-year period 2003 through 2012.

Location	Total Kjeldahl N (mg/L)	Ammonia N (mg/L)	Nitrate-Nitrite N (mg/L)	Total P (mg/L)	Dissolved P (mg/L)
Decatur, NE (RM691)	0.89	0.13	0.94	0.18	0.06
Rulo, NE (RM498)	1.22	0.15	1.68	0.36	0.09

The average mean daily flow of the Missouri River at Decatur (USGS gauge 06601200) and Rulo (USGS gauge 06813500) Nebraska was determined from USGS flow records. The average mean daily flow of the Missouri River at Decatur (period of record 1988 -2012) was determined to be 31,719 cfs (range = 7,070 - 189,000 cfs; median = 28,500 cfs). The average mean daily flow of the Missouri River at Rulo (period of record 1967 -2012) was determined to be 46,151 cfs (range = 7,450 – 302,000 cfs; median = 28,500 cfs). The mean daily flows were used to determine nutrient fluxes and loadings based on the Missouri River water quality conditions monitored by the Omaha District over the 10-year period 2003 through 2012. Table 16 and Table 17, respectively, summarize the mean nutrient fluxes and loadings for the Missouri River at Decatur and Rulo, Nebraska.

Table 16. Estimated mean nutrient fluxes in the Missouri River at Decatur, NE (RM691) and Rulo, NE (RM498) based on period of record flows and water quality conditions monitored during the 10-year period 2003 through 2012.

Location	Flow (cfs)	Total Kjeldahl N (kg/sec)	Ammonia N (kg/sec)	Nitrate-Nitrite N (kg/sec)	Total P (kg/sec)	Dissolved P (kg/sec)
Decatur, NE (RM691)	31,719	0.2105	0.0301	0.2656	0.0551	0.0150
Rulo, NE (RM498)	46,151	1.5943	0.1960	2.1954	0.4705	0.1176

Table 17. Estimated mean nutrient loadings in the Missouri River at Decatur, NE (RM691) and Rulo, NE (RN498) based on estimated mean nutrient fluxes.

Location	Flow (cfs)	Total Kjeldahl N (tons/day)	Ammonia N (tons/day)	Nitrate-Nitrite N (tons/day)	Total P (tons/day)	Dissolved P (tons/day)
Decatur, NE (RM691)	31,719	76.1	11.1	80.4	15.4	5.1
Rulo, NE (RM498)	46,151	151.8	18.7	209.1	44.8	11.2

5.3.2.2.5 Estimation of Nutrient Loadings from Potential Hydraulic Dredging Discharge for the Construction of SWH at the Proposed Middle Decatur Project Site

5.3.2.2.5.1 Calculated Nutrient Fluxes and Loadings from a Potential 20-Inch Hydraulic Dredge Discharge of Excavated Sediment/Soil

Potential nutrient fluxes from hydraulic dredging to excavate SWH at the proposed Middle Decatur project site were calculated. The calculated nutrient fluxes were based on use of a typical 20-inch hydraulic dredge (i.e. 43.6 cfs discharge), and mean nutrient levels determined from the sediment/soil samples collected from the proposed project site. As appropriate, nutrient fluxes for total (pre-elutriate and non-filtered elutriate), and dissolved (filtered elutriate) nutrients were estimated from pre-elutriate and elutriate testing results. Table 18 shows the calculated nutrient fluxes for Total Kjeldahl Nitrogen, Ammonia, Nitrate-Nitrite Nitrogen, Total Phosphorus, and Dissolved Phosphorus. Table 19 shows the estimated daily loadings (tons/day) based on the calculated nutrient fluxes. Table 20 compares the nutrient daily loadings calculated for the 20-inch hydraulic dredge discharge to the long-term average daily loadings for the Missouri River at Decatur (RM691) and Rulo (RM498) Nebraska.

Table 18. Nutrient flux rates calculated for a typical 20-inch hydraulic dredge discharge (43.6 cfs) based on mean sediment/soil nutrient levels sampled at the proposed Middle Decatur project site.

Total Kjeldahl Nitrogen (kg/sec)		Ammonia (kg/sec)		Nitrate-Nitrite Nitrogen (kg/sec)		Phosphorus (kg/sec)		
Pre-Elutriate	Non-Filtered Elutriate	Pre-Elutriate	Non-Filtered Elutriate	Pre-Elutriate	Filtered Elutriate	Pre-Elutriate	Non-Filtered Elutriate	Filtered Elutriate
0.0183	0.0014	0.0001	0.0004	0.0013	0.0008	0.0133	0.0004	0.00003

Table 19. Nutrient loadings estimated for a typical 20-inch hydraulic dredge discharge (43.6 cfs) operating 12 hours a day based on nutrient fluxes calculated for mean sediment/soil nutrient levels sampled at the proposed Middle Decatur project site.

Total Kjeldahl Nitrogen (tons/day)		Ammonia (tons/day)		Nitrate-Nitrite Nitrogen (tons/day)		Phosphorus (tons/day)		
Pre-Elutriate	Non-Filtered Elutriate	Pre-Elutriate	Non-Filtered Elutriate	Pre-Elutriate	Filtered Elutriate	Pre-Elutriate	Non-Filtered Elutriate	Filtered Elutriate
0.8701	0.0647	0.0059	0.0200	0.0611	0.0382	0.6332	0.0206	0.0012

Table 20. Comparison of daily nutrient loadings for the estimated dredging discharge from the proposed Middle Decatur shallow-water habitat construction project and the Missouri River average conditions at Decatur (RM691) and Rulo (RM498) Nebraska.

Total Kjeldahl Nitrogen (tons/day)		Ammonia (tons/day)		Nitrate-Nitrite Nitrogen (tons/day)		Phosphorus (tons/day)		
Pre-Elutriate	Non-Filtered Elutriate	Pre-Elutriate	Non-Filtered Elutriate	Pre-Elutriate	Filtered Elutriate	Pre-Elutriate	Non-Filtered Elutriate	Filtered Elutriate
20-inch Hydraulic Dredge Discharge (43.6 cfs)								
0.8701	0.0647	0.0059	0.0200	0.0611	0.0382	0.6332	0.0206	0.0012
Missouri River Long-Term Mean Conditions at Decatur – RM691 (Mean Flow = 31,719 cfs)								
76.1		11.1		80.4		15.4		5.1
20-in Hydraulic Dredge Discharge Load as a Percent of the Long-term Mean Missouri River Load at RM691								
1.14%	0.09%	0.05%	0.18%	0.08%	0.05%	4.11%	0.13%	0.02%
Missouri River Long-Term Mean Conditions at Rulo – RM498 (Mean Flow = 46,151 cfs)								
151.8		18.7		209.1		44.8		11.2
20-in Hydraulic Dredge Discharge Load as a Percent of the Long-term Mean Missouri River Load at RM498								
0.57%	0.04%	0.03%	0.11%	0.03%	0.02%	1.41%	0.05%	0.01%

Note: Dredge flow (43.6 cfs) to mean Missouri River flow (46,151 cfs) is 0.09% (i.e. a dredging discharge of 43.6 cfs would represent 0.09% of the mean Missouri River flow of 46,151 cfs when the dredge was discharging).

5.3.2.2.6 Comparison of Estimated Nutrient Loadings from Hydraulic Dredging at the Proposed Middle Decatur Project to Ambient Nutrient Loadings in the Missouri River

The District monitors water quality conditions in the Missouri River from near Landusky, MT (RM1922) to Rulo, NE (RM498). This includes seven locations monitored monthly since 2003 from the Gavins Point Dam tailwaters (RM810) to Rulo, NE. Nutrient constituents monitored monthly include Total Kjeldahl Nitrogen, Ammonia, Nitrate-Nitrite, Total Nitrogen, Total Phosphorus, and Dissolved Phosphorus. Figure 8 displays the mean daily loads calculated for Total Nitrogen, Nitrate-Nitrite Nitrogen, and Total Phosphorus for the seven monitored locations on the Missouri River downstream of Gavins Point Dam over the 5-year period 2007 through 2011. Figure 8 also shows the location of the proposed Middle Decatur project site. Figure 9 compares the estimated daily dredging discharge loading for Total Nitrogen, Nitrate-Nitrite Nitrogen, and Total Phosphorus and the calculated mean daily loads for the Missouri River immediately upstream (i.e. RM691) and downstream (i.e. RM619) of the proposed Middle Decatur project site. Total nitrogen was determined by adding Total Kjeldahl Nitrogen and Nitrate-Nitrite Nitrogen. As indicated in Table 20 and Figure 9, the estimated daily nutrient loading from the proposed Middle Decatur project site is minor compared to the nutrient mean daily loading currently present in the Missouri River. The greatest nutrient loading from the proposed dredging would be for Total Phosphorus where the dredging discharge daily loading could result in a 4.1% increase in the mean daily suspended Total Phosphorus loading currently present in the Missouri River. It is noted that some of the discharged particulate material, and associated phosphorus, would settle out in the Missouri River when discharged and be incorporated in the river's bed-load. The difference between a pre-elutriate sample and a non-filtered elutriate sample for Total Phosphorus is 1-hour of settling time. The elutriate testing of the collected Middle Decatur sediment samples resulted in mean pre-elutriate and non-filtered elutriate Total Phosphorus concentrations of 10.77 mg/L and 0.35 mg/L, respectively (i.e. 96.8% of the total phosphorus present in the pre-elutriate samples settled out after 1-hour).

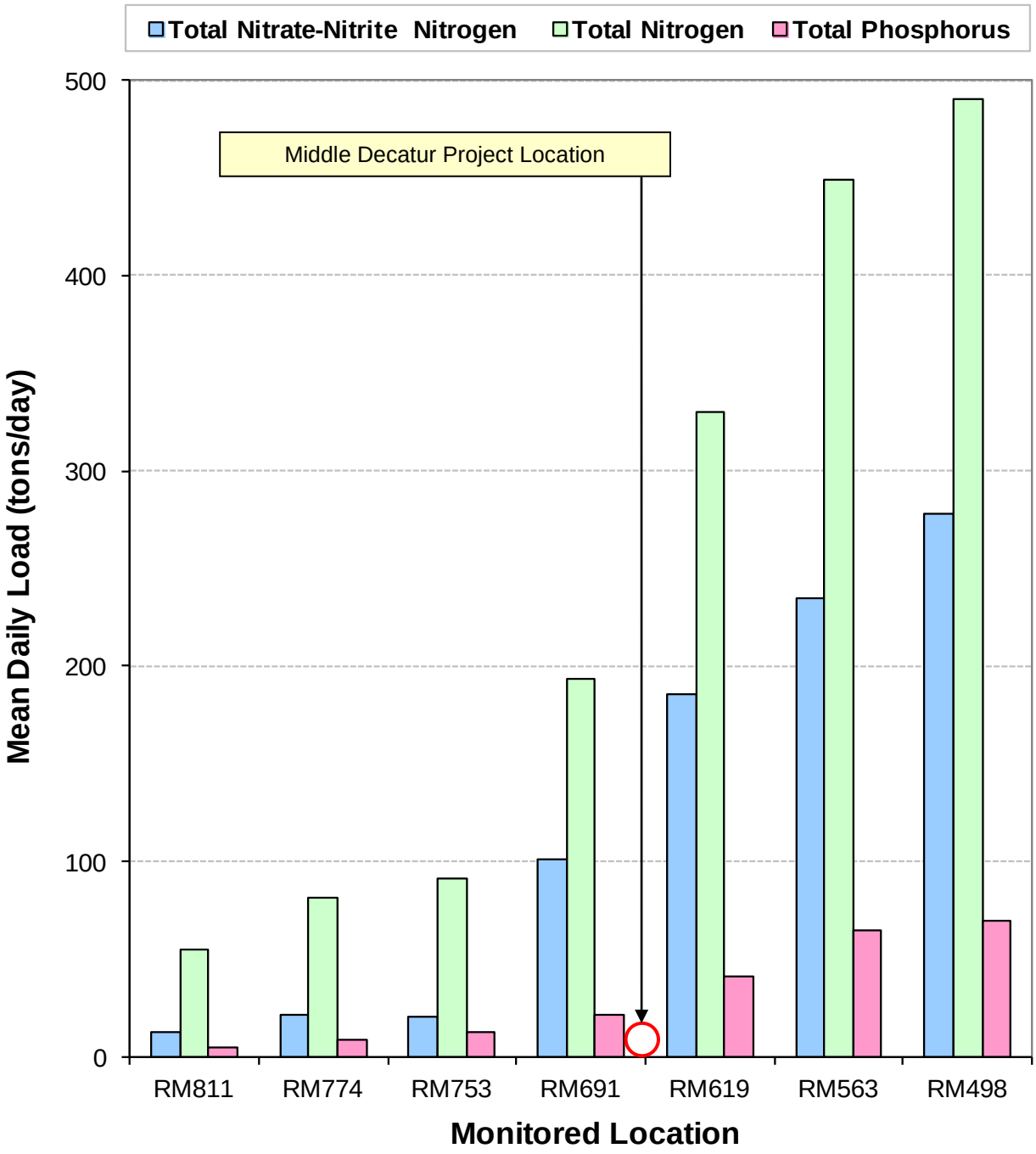


Figure 8. Mean daily loads for Total Nitrogen, Nitrate-Nitrite Nitrogen, and Total Phosphorus based on monthly monitoring along the Missouri River from Gavins Point Dam to Rulo, Nebraska over the 5-year period 2007 through 2011.

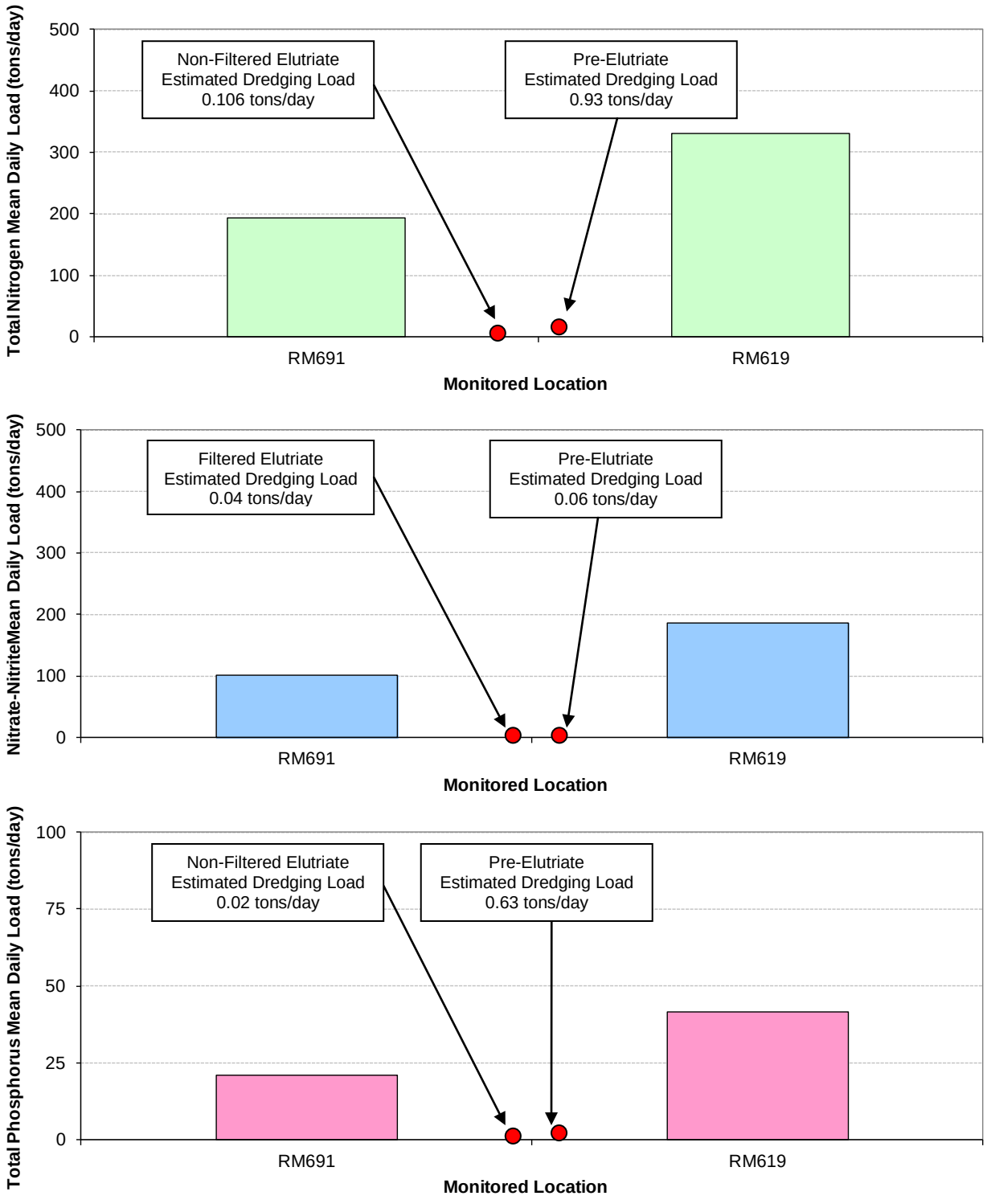


Figure 9. Comparison of estimated Total Nitrogen, Nitrate-Nitrite Nitrogen, and Total Phosphorus daily loadings from hydraulic dredging discharge to construct proposed shallow-water habitat at the Middle Decatur project site to mean daily loadings calculated for the Missouri River at RM691 and RM619 over the 5-year period 2007 though 2011.

5.4 Proposed Disposal Site Determinations

Mixing zone provisions for water quality standards application typically apply to "toxic contaminants" released from a point source discharge. State water quality standards, in most cases, define acute and chronic numeric criteria for toxic contaminants. Mixing zones are meant to provide water quality protection to a waterbody receiving a point source discharge, while at the same time allowing the discharge to initially mix and disperse within the receiving waterbody. Generally, mixing zones include both "acute" and "chronic" zones of mixing. Acute mixing zones (exceedance of acute criteria) are more restricted and typically must allow for a zone of passage for aquatic life and are not to extend across public drinking water supply intakes, heavily used recreation areas, mouths of tributary streams, etc. Chronic mixing zones (exceedance of chronic criteria) are less restrictive in that a zone of passage is typically not required, but they also typically are not to extend across public drinking water supply intakes and heavily used recreation.

The Section 404(b)(1) Guidelines, at §230.11(f), allow for mixing zones. Mixing zones for dredge and fill discharges are to be confined to the smallest practicable zone that is consistent with the type of dispersion determined to be appropriate. The following factors are identified in §230.11(f) for consideration in determining the acceptability of a proposed mixing zone:

- Depth of water at the disposal site;
- Current velocity, direction, and variability at the disposal site;
- Degree of turbulence;
- Stratification attributable to causes such as obstructions, salinity or density profiles at the disposal site;
- Rate of discharge;
- Ambient concentration of constituents of interest;
- Dredged material characteristics, particularly concentrations of constituents, amount of material, type of material (sand, silt, clay, etc.) and settling velocities;
- Number of discharge actions per unit of time; and
- Other factors of the disposal site that affect the rates and patterns of mixing.

Elutriate testing of the collected sediment/soil samples at the proposed Middle Decatur project site indicated that all assessed constituents, except Aluminum, met applicable acute and chronic Nebraska numeric water quality standards criteria. One elutriate test exceeded the chronic criteria for Aluminum. Pre-elutriate testing indicated potentially elevated total metals levels that could be problematic regarding Public Drinking Water Supply standards – there are no drinking water intakes in the immediate vicinity of the proposed dredging discharge at the Middle Decatur project site. Since a "regulated" mixing is not needed to ensure compliance with acute aquatic life water quality criteria and no drinking water supply intakes are in the immediate vicinity of the proposed dredging discharge, it's assumed complete mixing of the dredging discharge with the flow in the Missouri River is appropriate in evaluating potential impacts to existing water quality pursuant to State and Federal antidegradation provisions. It is assumed antidegradation provisions would apply at the edge of a permitted mixing zone.

5.4.1 Completely Mixed Conditions

Impacts of the proposed dredging discharge on existing water quality in the Missouri River was evaluated after consideration was given for complete mixing of the dredging discharge with the long-term mean flow in the Missouri River. This was accomplished by calculating a flow-weighted average concentration for a water quality constituent based on flow and constituent concentration in the Missouri River and dredging discharge. The average mean daily flow of the Missouri River at Decatur, Nebraska was determined from USGS flow records (USGS gauge 06813500). The average mean daily flow of the Missouri River at Decatur (period of record 1988 -2012) was determined to be 31,719 cfs (range = 7,070 - 189,000 cfs; median = 28,500 cfs).

5.4.2 Existing Missouri River Water Quality

Since 2003, the District has monitored water quality conditions monthly at seven locations along the Missouri River from the Gavins Point Dam tailwaters to Rulo, Nebraska. Constituents monitored monthly include Chemical Oxygen Demand, Total Organic Carbon, Total Kjeldahl Nitrogen, Ammonia, Nitrate-Nitrite, Total Nitrogen, Total Phosphorus, and Dissolved Phosphorus. The elutriate testing results of the sediment/soil collected at the proposed Middle Decatur project site were compared (plotted) to the ambient water quality conditions monitored in the Missouri River over the 5-year period 2007 through 2011 (Figures 10 - 17). Calculation of completely mixed conditions was applied to the estimated pre-elutriate results for Total Organic Carbon, Total Kjeldahl Nitrogen, and Total Phosphorus; and monitored Missouri River water quality conditions over the 10-year period (2003 - 2012). Table 21 summarizes the calculation of completely mixed conditions for Total Organic Carbon, Total Nitrogen, and Total Phosphorus.

Table 21. Completely mixed, flow-weighted conditions for estimated pre-elutriate concentrations of Total Organic Carbon, Total Kjeldahl Nitrogen and Total Phosphorus.

Water Quality Constituent	Missouri River		Dredging Discharge		Completely Mixed Concentration
	Average Flow (cfs)	Average Concentration	Design Flow (cfs)	Average Pre-Elutriate Concentration	
Carbon, Total Organic (mg/L)	31,719	4.5	43.6	248	4.8
Nitrogen, Kjeldahl Total as N (mg/L)	31,719	0.89	43.6	14.8	0.91
Phosphorus, Total (mg/L)	31,179	0.18	43.6	10.8	0.19

5.5 Summary of Water Quality Factual Determinations

- Elutriate testing of the collected sediment/soil samples at the proposed Middle Decatur project site indicated that all assessed constituents, except Aluminum, met applicable acute and chronic Nebraska numeric water quality standards criteria. The chronic criterion for Aluminum was slightly exceeded. Elutriate testing results were for both dissolved and non-filtered elutriate sample analyses prepared in accordance with the *"Inland Testing Manual"*.
- The proposed dredging discharge at the Middle Decatur SWH project site would likely have only minor, short-term impacts to the existing water quality of the Missouri River; especially after complete mixing is achieved in the river. Based on analyzed water quality constituents, only minor increases in constituent concentrations, within the natural variability of water quality in the Missouri River, are indicated.
- The dredging discharge to construct SWH at the proposed Middle Decatur project site would likely cause a slight increase to the nutrient loading currently present in the Missouri River. It is estimated that the mean daily suspended load for Total Kjeldahl Nitrogen could be increased by 1.14%, the mean daily suspended load for Nitrate-Nitrite Nitrogen could be increased by 0.08%, and the mean daily suspended load for Total Phosphorus could be increased by 4.11%. It is noted that the 4.11% increase in the suspended Total Phosphorus loadings is a worst-case estimate. Most of the suspended Total Phosphorus load is bound to particulate matter. As such, some will settle and become incorporated into the bed-load of the Missouri River**.** As indicated by elutriate testing results, the estimated mean suspended Total Phosphorus concentration of 10.8 mg/L (pre-elutriate) could decrease to 0.35 mg/L (non-filtered elutriate) after 1-hour of settling time (i.e. 96.8% of the total phosphorus present in the pre-elutriate samples settled out after 1-hour).

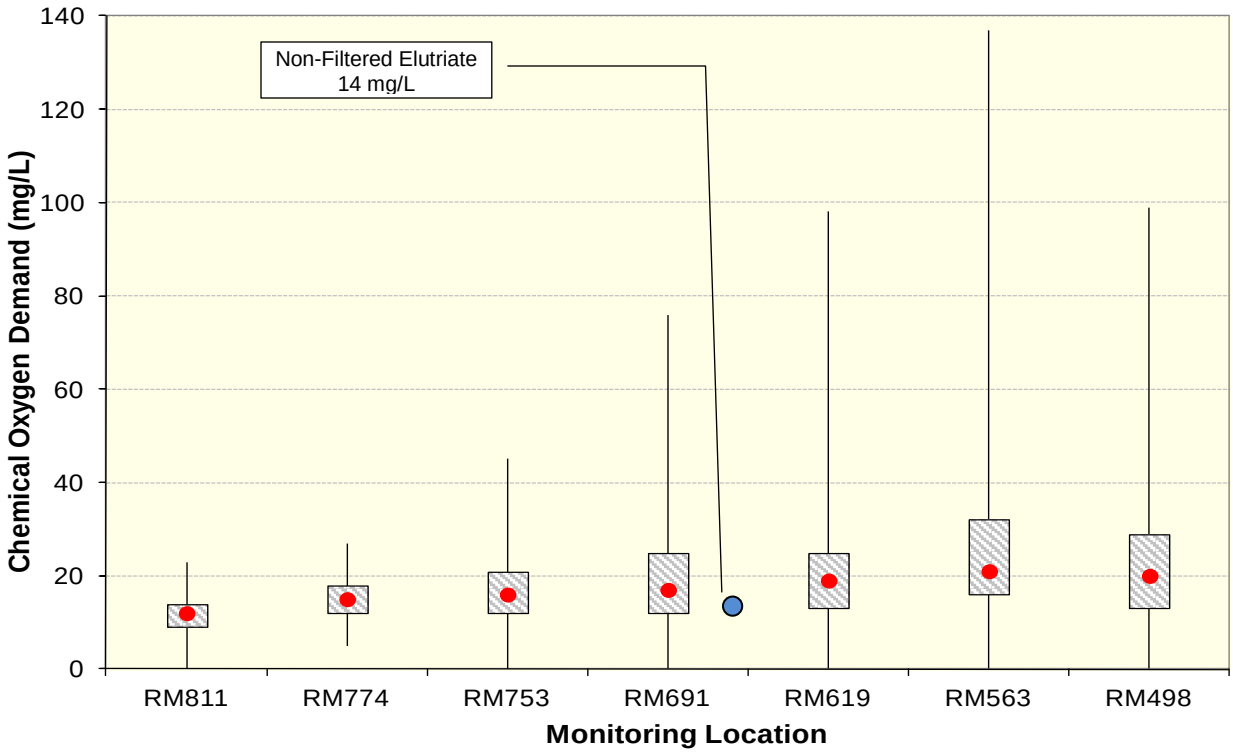


Figure 10. Mean elutriate testing results for Chemical Oxygen Demand as compared to ambient Missouri River conditions monitored over the 5-year period 2007 through 2011. Box plot displays minimum and maximum (whiskers) and inter-quartile range, red dot is the median value.

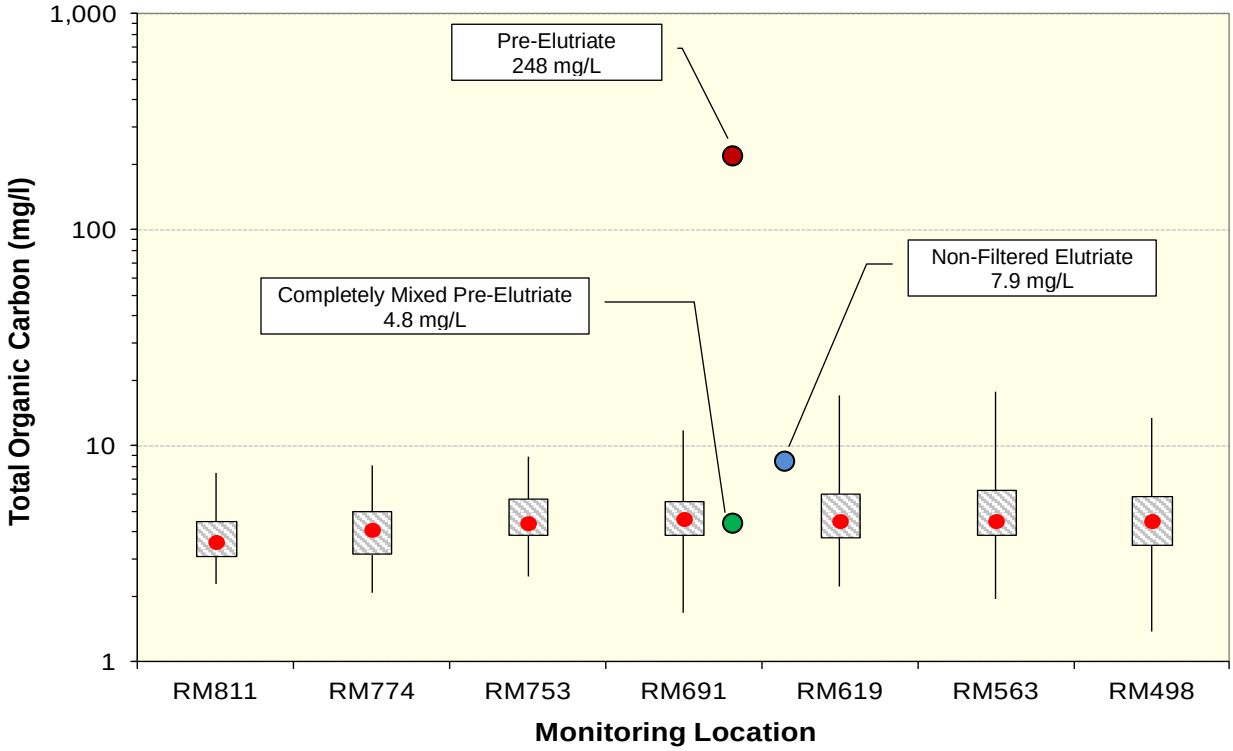


Figure 11. Mean elutriate testing results for Total Organic Carbon as compared to ambient Missouri River conditions monitored over the 5-year period 2007 through 2011.

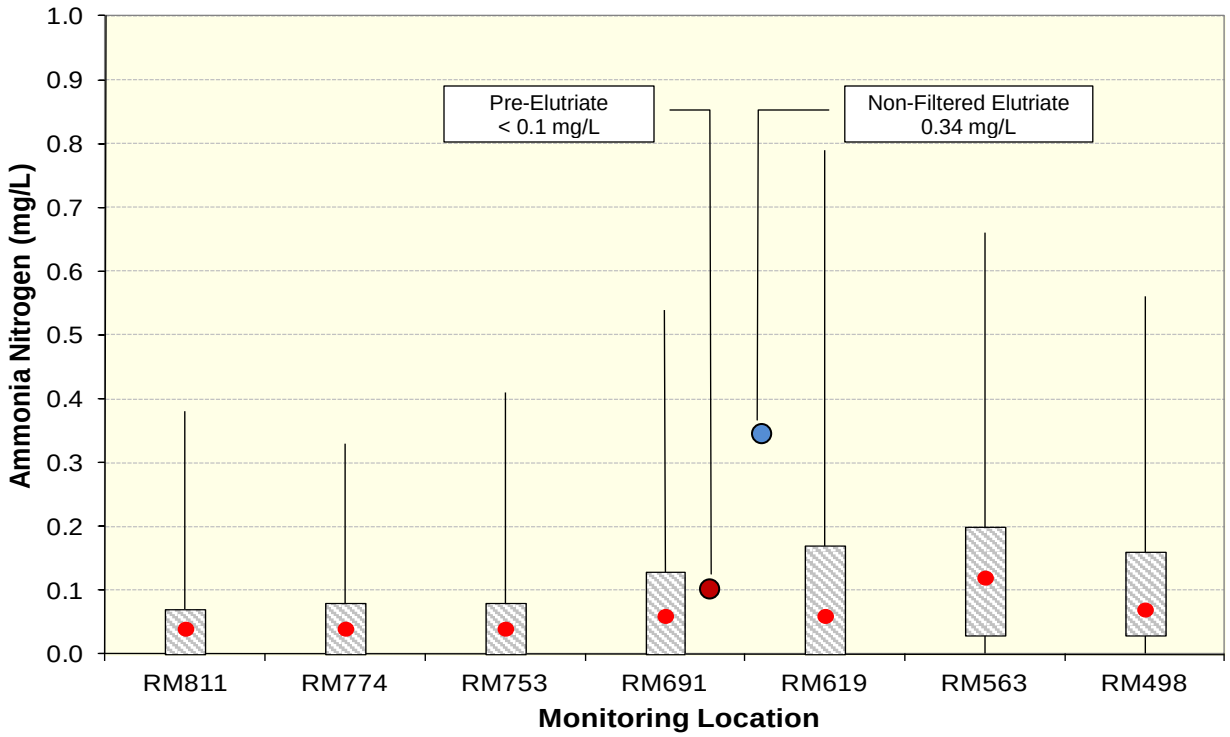


Figure 12. Mean elutriate testing results for Ammonia as compared to ambient Missouri River conditions monitored over the 5-year period 2007 through 2011.

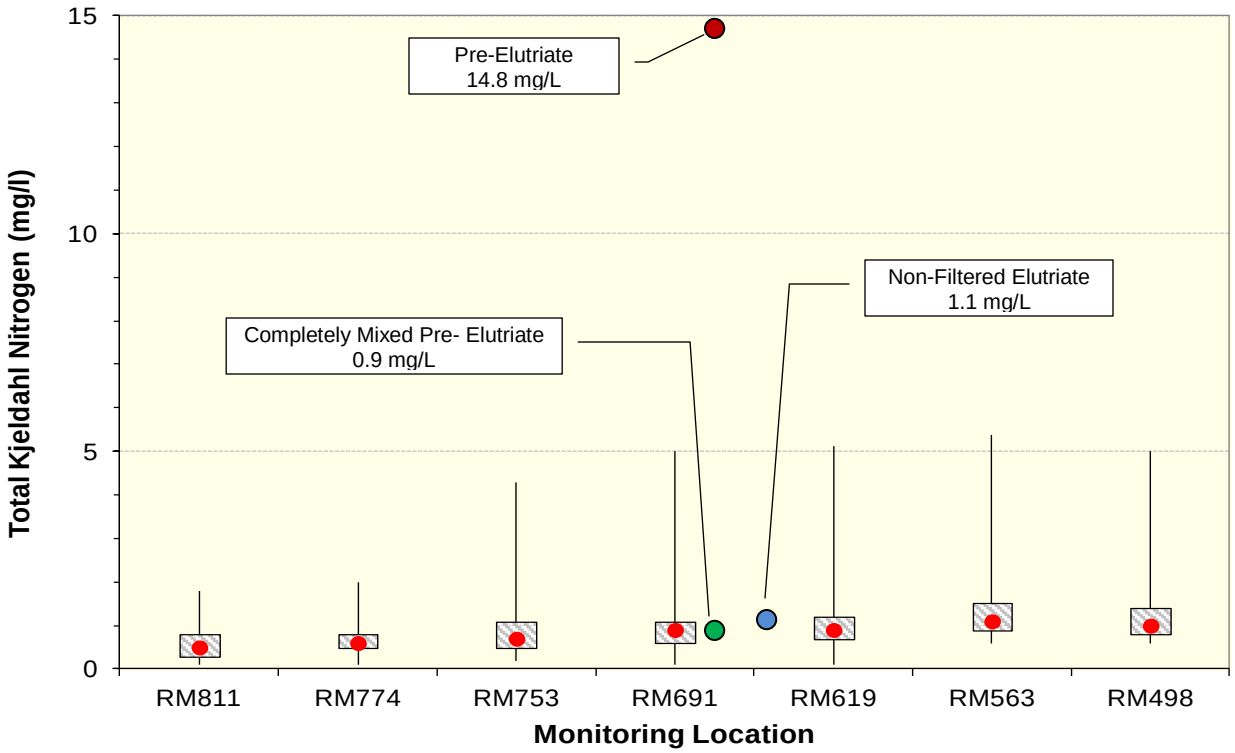


Figure 13. Mean elutriate testing results for Total Kjeldahl Nitrogen as compared to ambient Missouri River conditions monitored over the 5-year period 2007 through 2011.

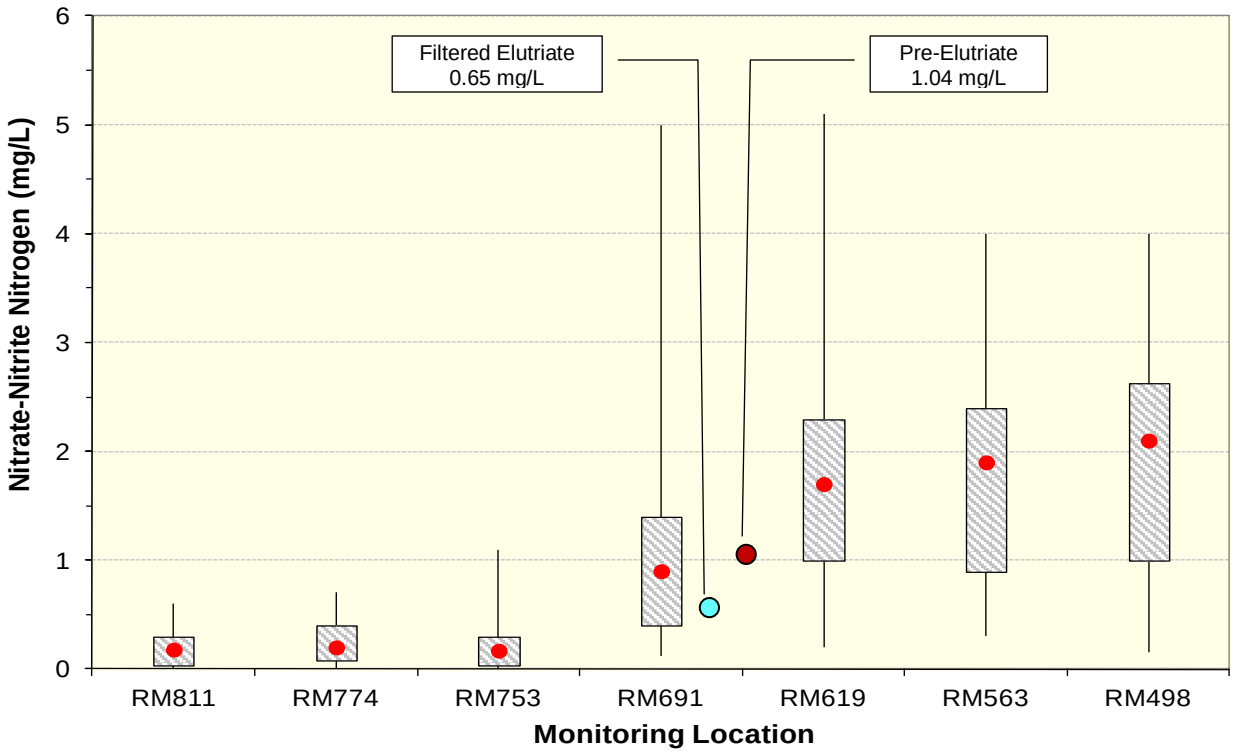


Figure 14. Mean elutriate testing results for Nitrate-Nitrite Nitrogen as compared to ambient Missouri River conditions monitored over the 5-year period 2007 through 2011.

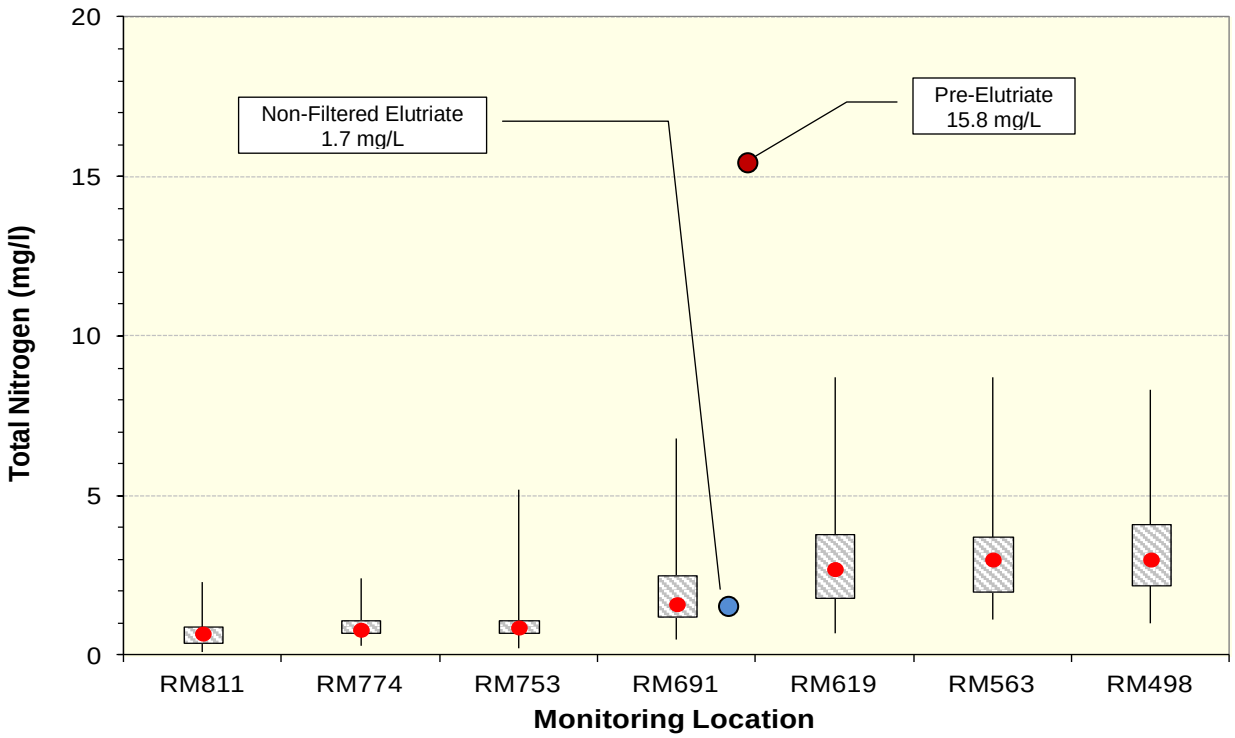


Figure 15. Mean elutriate testing results for Total Nitrogen as compared to ambient Missouri River conditions monitored over the 5-year period 2007 through 2011.

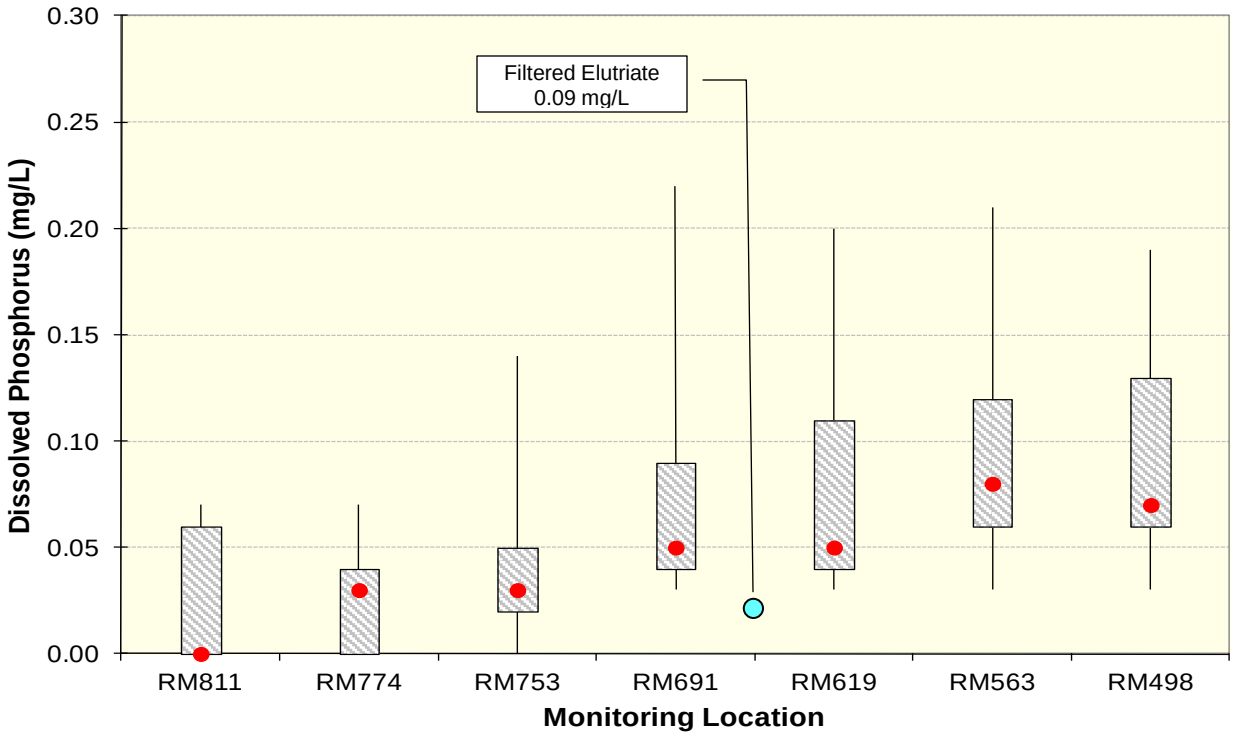


Figure 16. Mean elutriate testing results for Dissolved Phosphorus as compared to ambient Missouri River conditions monitored over the 5-year period 2007 through 2011.

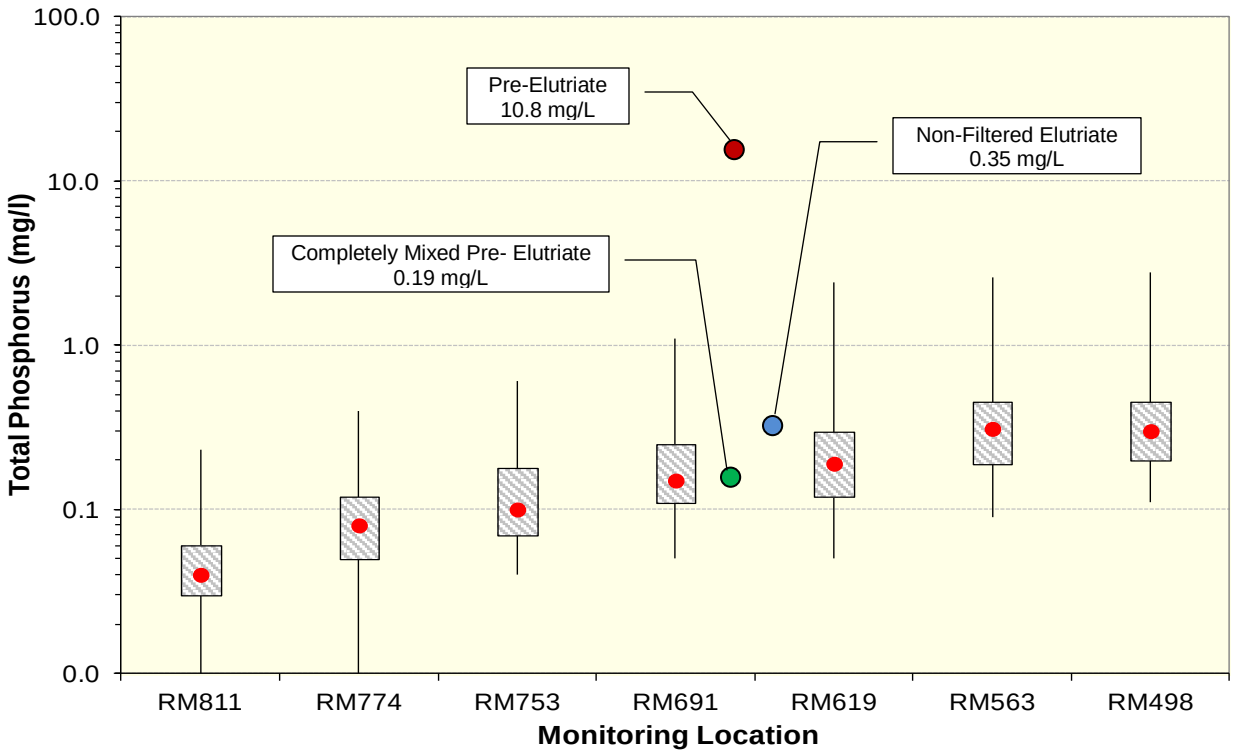


Figure 17. Mean elutriate testing results for Total Phosphorus as compared to ambient Missouri River conditions monitored over the 5-year period 2007 through 2011.

6 REFERENCES

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ATTACHMENT 1.

Quality Control Plan for 2013 Elutriate Testing

at the

Proposed Middle Decatur Shallow Water Habitat Site

QUALITY CONTROL PLAN

for

2013 Elutriate Sampling – Missouri River
Middle Decatur SWH Project Area

Project Number: SPS-MIDDEC-001

Prepared By:

Water Control and Water Quality Section
Hydrologic Engineering Branch
U.S. Army Corps of Engineers – Omaha District

April 2013

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Paul Jensen — 9-Apr-13
USACE – Water Quality Unit Team Leader — Date

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Luke Wallace — 11-April-13
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1. PROJECT DESCRIPTION

1.1. BACKGROUND INFORMATION

Shallow water habitat (SWH) was previously constructed along the Missouri River as part of the Middle Decatur Bend project. The District plans to restore connectivity to previously constructed SWH by cleaning out the original flow path and excavating a new inlet. The removal of newly deposited sediment will involve hydraulic dredging and it is proposed that the dredge spoil be discharged to the adjacent Missouri River. It is believed the sediment to be dredged was largely deposited during the Missouri River flood of 2011 and will be primarily sand with some silts and clays.

1.1.1. Project Location

The proposed Middle Decatur project site is located along the Missouri River at RM689 just east of Decatur, Nebraska (Figure 1). The proposed project site is on the east side of the Missouri River, but within the jurisdiction of Burt County, Nebraska. Figure 2 indicates the proposed areas to be excavated at the Middle Decatur project site.

1.1.2. 404 Permitting Requirements

The requirements for a U.S. Army Corps of Engineers (USACE) individual Section 404 permit must be met for the proposed dredging activity. To meet the Section 404 Individual Permit requirements, a Section 401 Certification "letter" will be requested from the Nebraska Department of Environmental Quality (NDEQ) stating that the proposed actions will not "violate" water quality standards. To facilitate review of the proposed project for Section 401 Certification, "elutriate testing" of sediment/soil collected from the proposed dredging site will be conducted. This monitoring project plan was developed to collect the appropriate samples for elutriate testing pursuant to the U.S. Environmental Protection Agency (USEPA) and USACE guidance document, "Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S. – *Inland Testing Manual"* (USEPA and USACE, 1998).

2. PROJECT/TASK ORGANIZATION AND RESPONSIBILITIES

The Omaha District's Water Control and Water Quality Section will conduct the sampling required to facilitate elutriate testing of prospective dredge material in the project area. Collected samples will be delivered to Midwest Laboratories, Inc. Omaha, NE for preparation and analysis of elutriate samples.

Staff Responsibilities and Contacts for Sampling:
Sample Collection: Dave Jensen (995-2310), Bill Otto (995-2313), John Hargrave (995-2347)
Sampling Coordination: Dave Jensen
Data Quality Review: Dave Jensen
Water Quality Sampling Report: Dave Jensen
Laboratory Analysis: Midwest Laboratories, Prem Arora (402-829-9878)
Middle Decatur SWH Project Coordinator: Amanda Ciurej

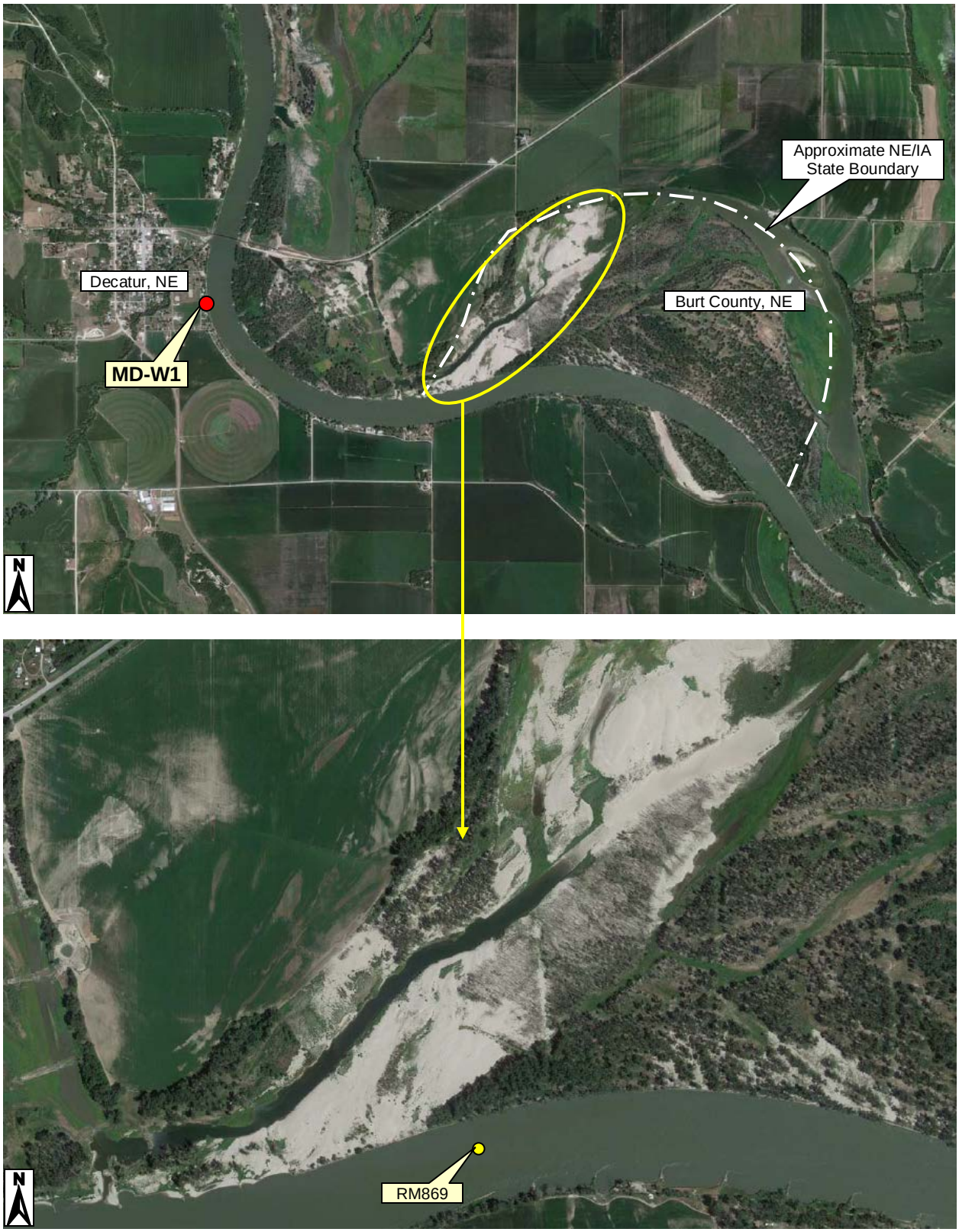

Figure 1. Location of proposed Middle Decatur project site.

Figure 2. Proposed areas for excavation to restore connectivity at the Middle Decatur project site

3. SITE-SPECIFIC WATER QUALITY CONCERNS

3.1. SECTION 303(D) IMPAIRED WATERS LISTINGS

Nebraska's water quality standards identify the Missouri River from the Big Sioux River to the Platte River as designated Segment MT1-10000. Segment MT1-10000 is listed on Nebraska's 2012 Section 303(d) list as impaired due to a fish consumption advisory. The identified parameters of concern are Cancer Risk & Hazard Index Compounds, specifically, Dieldrin and PCBs. After the Nebraska Department of Environmental Quality (NDEQ) published their 2012 Integrated Water Quality Report and Section 303(d) list on 1-April-2012 that listed Segment MT1-10000 as impaired due to the fish consumption advisory in effect, the NDEQ published the report, "Findings of the 2010 Regional Ambient Fish Tissue Program in Nebraska" in June, 2012 (NDEQ, 2012). That report indicated that Dieldrin and PCBs were no longer a fish tissue concern on Segment MT1-10000. This resulted in the fish consumption advisory for the Missouri River regarding Dieldrin and PCBs being removed. Based on the removal of the fish consumption advisory for the Missouri River, the NDEQ has indicated that the 303(d) listing of the Missouri River for Dieldrin and PCBs will be removed in the next published 303(d) listing (personal communication NDEQ). As such, the Missouri River in the area of the proposed Middle Decatur project site will not be identified as impaired from Cancer Risk & Hazardous Index Compounds (i.e. Dieldrin and PCBs) by Nebraska's next 303(d) list of impaired waters. Personnel communication with NDEQ has indicated that elutriate testing for Dieldrin and PCBs to a detection limit of 0.4 parts-per-trillion is no longer required.

3.2. NUTRIENTS

Concerns have been expressed regarding the nutrient enrichment and loading that the proposed dredging for SWH construction might pose to the Missouri River and ultimately to the Gulf of Mexico. Currently, no numeric water quality standards criteria have been promulgated by the States of Nebraska or Iowa for the Missouri River regarding nutrient enrichment. The State of Iowa has recently released the draft document, "*Iowa Nutrient Reduction Strategy – A science and technology-based framework to assess and reduce nutrients to Iowa waters and the Gulf of Mexico"* (IDALSW et. al, 2012). The Iowa strategy follows the recommended framework provided by EPA in 2011, and is only the second state to complete a statewide nutrient reduction strategy. The Iowa Nutrient Reduction Strategy is a science and technology-based framework to assess and reduce nutrients to Iowa waters and the Gulf of Mexico. It is designed to direct efforts to reduce nutrients in surface water from both point and nonpoint sources in a scientific, reasonable, and cost-effective manner. The Iowa strategy proposes a pragmatic, strategic and coordinated approach for reducing nutrient loads discharged from the state's largest wastewater treatment plants, in combination with targeted practices designed to reduce loads from nonpoint sources now while evaluating the future need for nutrient water quality standards.

For background information, nutrient analysis will be included in the elutriate testing of sediment/soil samples collected at the proposed Middle Decatur project site.

4. DATA QUALITY OBJECTIVES

A Water Quality Sampling Report and Factual Determinations will be prepared that compiles results of the elutriate testing of representative sediment/soil samples collected at the Middle Decatur project site, and assesses the water quality impacts the proposed hydraulic dredging at the project site poses to the Missouri River. The report will be provided to the

NDEQ to facilitate appropriate Section 401 water quality certification review of the proposed dredging project by the State of Nebraska. The report will also be provided to the Iowa Department of Natural Resources (IDNR) for informational use, and will be used by the Omaha District to finalize the dredging plan for construction of SWH at the proposed Middle Decatur project site.

5. DATA COLLECTION APPROACH

5.1. SAMPLING LOCATIONS

Sediment/soil samples will be collected at 2 sites: MD-S1 and MD-S2 (Table 1). The locations of the two sediment/soil sampling sites are shown in Figures 2 and 3. Receiving water (Missouri River) samples will be collected at the Decatur, NE boat ramp, site MD-W1 (Figure 1). The "actual" locations of the sampled sites will be determined with a GPS unit in the field when the samples are collected (Attachment 1).

Table 1. Geo-referenced locations of sediment/soil sampling sites at the proposed Middle Decatur shallow-water habitat project site.

Site	Latitude	Longitude
MD-S1	42° 00' 14.1"	96° 12' 36.4"
MD-S2	42° 00' 18.1"	96° 12' 26.2"

5.2. MEASUREMENT AND SAMPLING METHODS

5.2.1. Receiving Water Sample

Water collected from the Missouri River near the project site (i.e., receiving water) will be used for elutriate testing. The laboratory requires 4 parts receiving water for each 1 part of soil/sediment to be analyzed. In addition to the 4 parts of water for each 1 part soil/sediment, additional receiving water is required for analysis. The receiving water will be collected at the Decatur, NE boat ramp (Site MD-W1) just upstream from the proposed Middle Decatur SWH project area (Figure 1).

At the time the receiving water is collected, the following field measurements will be taken: water temperature, dissolved oxygen (mg/L and % saturation), pH, specific conductance, and turbidity. These measurements will be obtained with a "HydroLab" equipped with a MS5 DataSonde and Surveyor data logger. Measurements will be taken by immersion of the DataSonde directly into the river. Measurements will be appropriately recorded on a field sheet (Attachment 1).

5.2.2. Sediment/Soil Samples

Sediment/soil samples will be collected at Sites MD-S1 and MD-S2. The equipment, supplies, and procedures to be used to collect the sediment/soil samples are as follows.

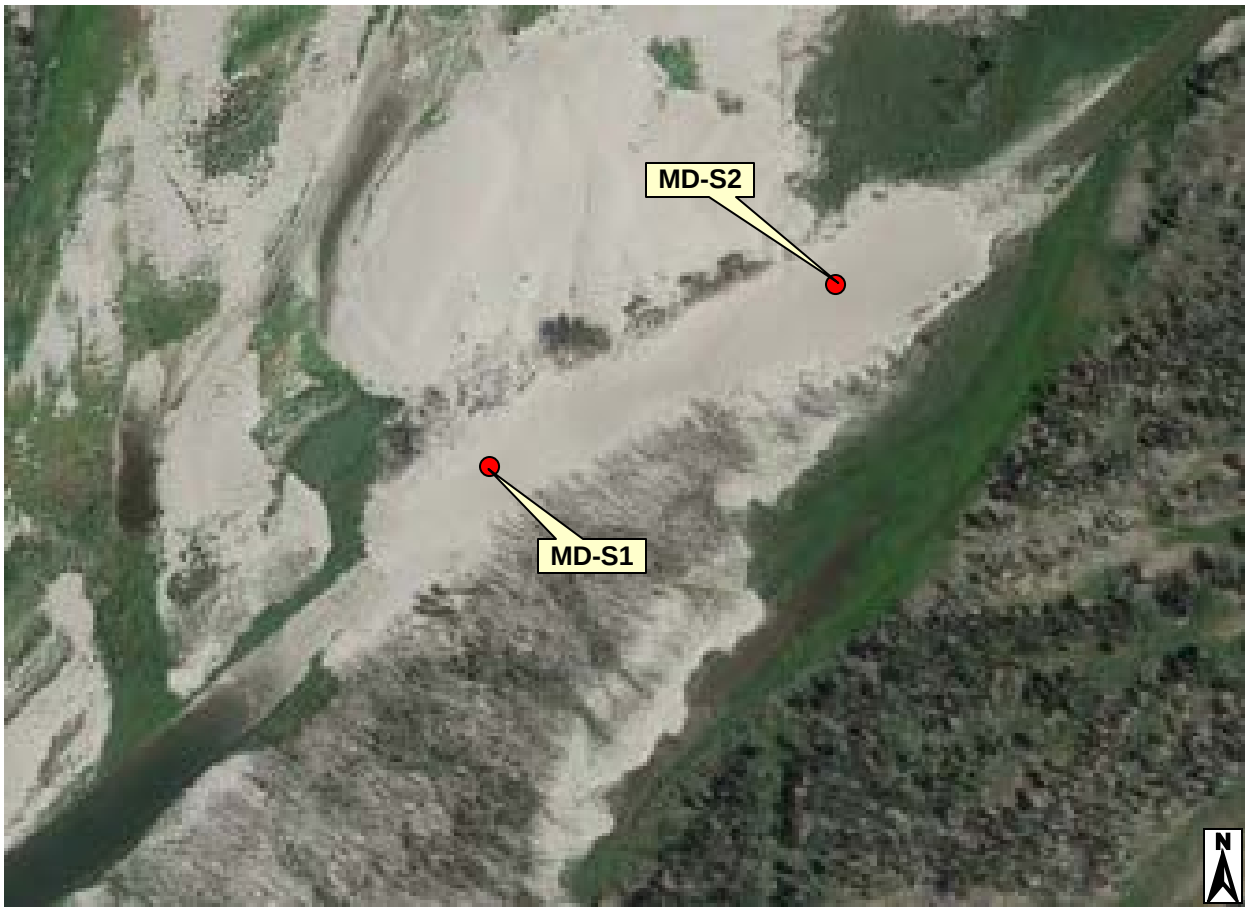

Figure 3. Locations of sites where sediment/soil samples will be collected for analysis and elutriate testing. *(Site locations shown on 18-July-2012 Google Earth aerial photo of proposed project site.)*

5.2.2.1. Equipment and Supplies

1) Gas powered auger head
2) Stainless steel coring device
3) Gasoline
4) 1-gallon wide-mouth glass jars
5) 1-gallon narrow-mouth glass jugs
6) Sample bottle labels
7) COC
8) Field Sheets
9) GPS device
10) 5-gallon buckets
11) Shovel
12) Miscellaneous tools to remove collected sediment from coring device (i.e., wood stakes, mallet, screwdriver, putty knife, etc.)
13) Scrub brush

5.2.2.2. Sediment/Soil Collection Procedure

1) Select sample site and record general information (including Latitude/Longitude) on the field sheet.
2) Remove any vegetation near the proposed boring site (2-3 foot diameter circle).
3) Set out equipment near the boring site making sure to keep extraneous material out of the sample collection bucket.
4) Attach the corer to the auger head, bore down and collect sample in approximately one-foot increments.
5) After each coring, detach the device from the gas auger, suspend the corer over the sample collection bucket and deposit the collected material into the 5-gallon collection bucket.
6) Heavy clays may require a screwdriver, hammer and/or wooden stake or other tools to remove the sample from the corer.
7) When all cores for one sediment/soil sample have been collected in the bucket, homogenize the contents and fill a 1-gallon, wide-mouth glass jar. Affixing the sample label to the jar prior to filling it with the sample ensures good adhesion.
8) Clean the coring device, tools and sample collection bucket between sample collections.
9) Deliver the samples and an analytical request form or chain-of-custody to the laboratory analyzing the samples.

5.2.3. Preparation of Elutriate Samples

Elutriate testing will been done on sediment/soil samples collected at Sites MD-S1 and MD-S4. The procedures that will be used to process collected sediment/soil samples for elutriate testing is depicted in Figure 4.

5.2.3.1. Standard Elutriate Samples

Standard elutriate samples will be prepared in accordance with the "*Inland Testing Manual*." Elutriate sample will be prepared by using receiving water collected from the Missouri River at site MD-W1. The sample is prepared in the laboratory by sub-sampling approximately 1-liter of the collected sediment/soil sample from the well-mixed original sample. The sediment material and unfiltered receiving water were then combined in a sediment-to-water ratio of 1:4 on a volume basis at room temperature (22 $\pm$ 2°C). The 1:4 sediment-to-water ratio is believed to represent "end-of-pipe" discharge conditions for hydraulic dredging**.** After the correct ratio is achieved, the mixture is stirred vigorously for 30 minutes with a mechanical stirrer/shaker. After the 30-minute mixing period, the mixture is allowed to settle for one hour. The supernatant is then siphoned off without disturbing the settled material. Analysis for total constituents is done on the supernatant without filtration, and the supernatant is filtered through a 0.45-micron filter for analysis of dissolved constituents. The filtered water is the standard elutriate sample identified by the *"Inland Testing Manual"* and represents the constituents that could be released from dredged material during the hydraulic dredging process.

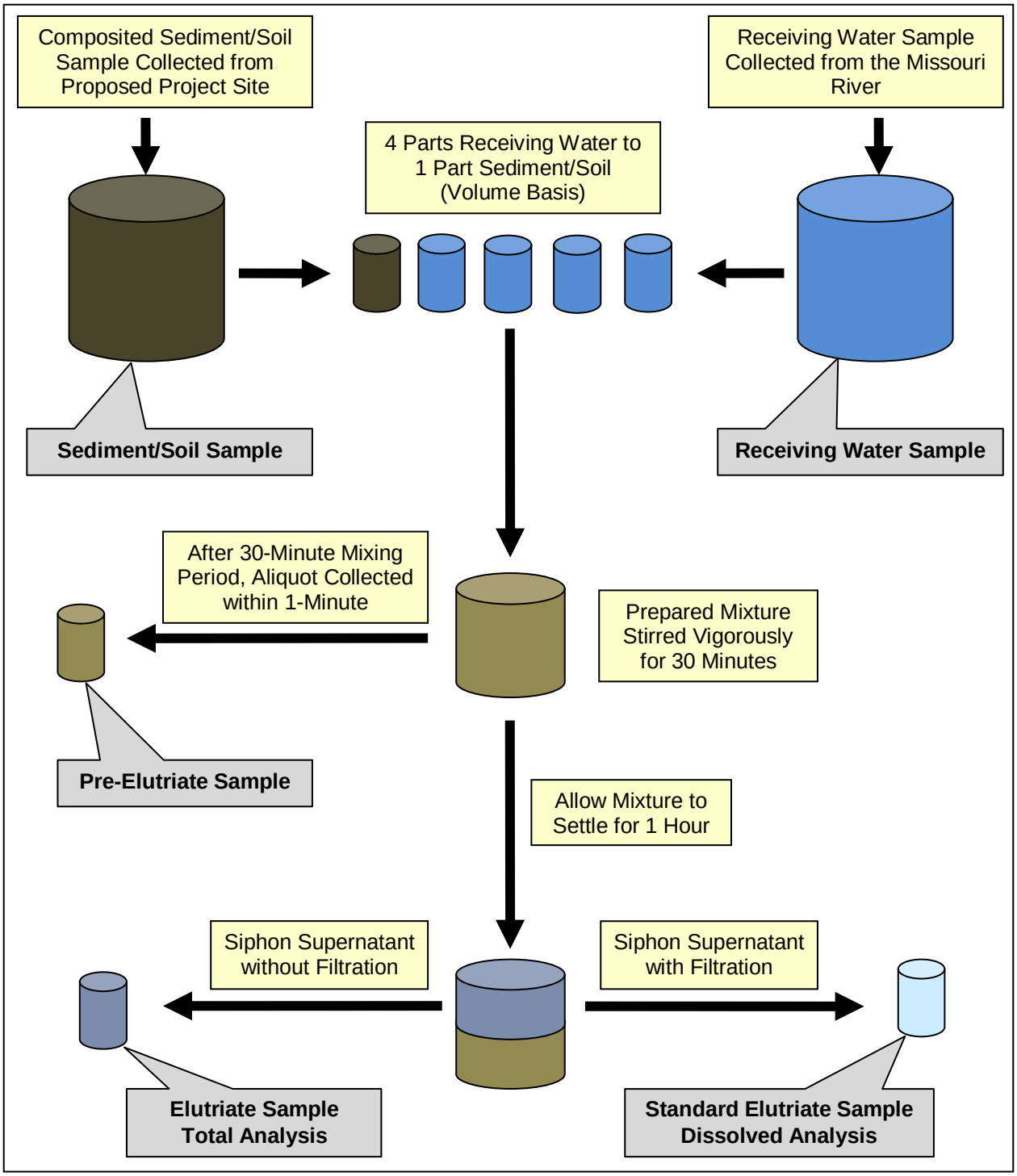

Figure 4. Procedures to be used to process collected sediment/soil samples for elutriate testing.

5.2.3.2. Pre-Elutriate Samples

Pre-elutriate samples will be prepared for analysis of selected constituents. The pre-elutriate samples are prepared the same as standard elutriate samples through the point of the

30-minute mixing period. At that time an aliquot of water is immediately drawn off the mixed solution and identified as the pre-elutriate sample. The pre-elutriate sample is believed to represent conditions of the "end-of-pipe" hydraulic dredging discharge slurry prior to any mixing with the receiving water (i.e. Missouri River).

5.3. SAMPLE HANDLING, CUSTODY, AND TRANSPORT

The collected samples will be transported by sampling personnel to Midwest Laboratories, Inc. in Omaha, Nebraska for elutriate testing and analysis. A Chain-of-Custody (COC) will be completed and submitted with the samples delivered to the laboratory.

5.3.1. Sample Bottle Labels

Sample bottle labels will be provided by Midwest Laboratories. A spreadsheet will be provided to the contract laboratory that identifies the sites, parameters, bottle size, and preservatives for the samples to be collected. Midwest Laboratories will use the spreadsheet to prepare the necessary sample bottle labels and a COC.

5.3.2. Sample Handling, Transport, and Delivery to the Laboratory

Upon completion of sample collection, preservation, and labeling, those samples requiring chilling to 4° C should be stored in an iced cooler. Samples not requiring cooling can be stored by any convenient, but non-contaminable method. Samples are to be at all times stored in an upright condition. Samples will be transported by Water Quality Unit personnel directly Midwest Laboratories.

A COC will be completed and submitted with all samples delivered to Midwest Laboratories. Laboratory personnel should be alerted an appropriate time in advance of when samples are going to be delivered so any necessary arrangements for sample receipt by Midwest Laboratories can be made.

Samples delivered to Midwest Laboratories by Water Quality Unit personnel will be taken to a staging area and grouped by sample location. This will provide an accurate count of sample bottles delivered and allow for ease of log in by laboratory personnel. Laboratory personnel will compare the physical samples to information on the COC, sign and date the form, and provide a copy. The original COC form will be retained by the laboratory. Once samples are logged-in they are to be maintained at 4° C until analysis is completed. Sample water is typically retained for at least 30 days beyond analysis.

5.4. PARAMETERS TO BE MEASURED

The parameters that will be measured or analyzed for the different types of samples are listed in Table 2.

5.5. LABORATORY ANALYTICAL METHODS AND COSTS

Table 3 provides methods, detection limits, and costs for parameters to be analyzed on collected sediment/soil samples. Table 5 provides methods, detection limits, and costs for parameters to be analyzed on pre-elutriate samples. Table 7 provides methods, detection limits, and costs for parameters to be analyzed on standard filtered elutriate samples. Table 8 provides methods, detection limits, and costs for parameters to be analyzed on non-filtered

elutriate samples. Table 10 provides methods, detection limits, and costs for parameters to be analyzed on receiving water.

Table 2. Parameters to be measured and analyzed.

Parameter	Soil	Receiving Water	Pre-Elutriate Water	Elutriate Water	
				Non-Filtered	Filtered
FIELD MEASUREMENTS					
Water Temperature (°C)		X			
Dissolved Oxygen (mg/L and % Sat)		X			
pH (S.U.)		X			
Specific Conductance (µS/cm)		X			
Turbidity		X			
PHYSICAL AND AGGREGATE PROPERTIES					
Particle Size	X				
pH	X				X
Total Suspended Solids		X	X	X	
Turbidity			X	X	
NUTRIENTS					
Nitrogen, Ammonia as N	X	X	X	X	X
Nitrogen, Nitrate/Nitrite as N)	X	X	X		X
Nitrogen, Total Kjeldahl as N	X	X	X	X	
Phosphorus, Dissolved		X			X
Phosphorus, Orthophosphate		X			X
Phosphorus, Total	X	X	X	X	
AGGREGATE ORGANIC CONSTITUENTS					
CBOD		X	X	X	
Chemical Oxygen Demand		X	X	X	
Organic Carbon, Total	X	X	X	X	
METALS (Dissolved)					
Dissolved Metals Scan		X			X
METALS (Total)					
Total Metals Scan	-----	X	X	X	
Arsenic, Total	X				
Cadmium, Total	X				
Chromium, Total	X				
Copper, Total	X				
Lead, Total	X				
Mercury, Total	X				
Nickel, Total	X				
Zinc Total	X				
PESTICIDES and PCBs					
Atrazine	X	X		X	
Organochlorine Pesticide/PCB Scan	X	X		X	

Table. 3. Parameters to be Analyzed on Collected Sediment/Soil Samples and Unit Costs.

Parameter	Method	Detection Limit	Analytical Cost
PHYSICAL AND AGGREGATE PROPERTIES			
Particle Size	Sieve (Minimum Sieve #200)	0.001 mm	$60.00
pH	EPA 150.1	0.1 S.U.*	12.00
NUTRIENTS			
Nitrogen, Ammonia Total as N	EPA 350.1	0.02 mg/kg	17.70
Nitrogen, Kjeldahl Total as N	EPA 351.3	0.2 mg/kg	27.50
Nitrogen, Nitrate/Nitrite Total as N	EPA 353.2	0.02 mg/kg	13.00
Phosphorus, Total	SM4500PF	0.02 mg/kg	27.00
AGGREGATE ORGANIC CONSTITUENTS			
Total Organic Carbon	EPA 415.1	0.4 mg/kg	22.00
TOTAL METALS			
Arsenic, Total	EPA 6010B	10 mg/kg	12.75
Cadmium, Total	EPA 6010B	0.2 mg/kg	12.75
Chromium, Total	EPA 6010B	1 mg/kg	12.75
Copper, Total	EPA 6010B	1 mg/kg	12.75
Lead, Total	EPA 6010B	13 mg/kg	12.75
Mercury, Total	EPA 6010B	0.1 mg/kg	12.75
Nickel, Total	EPA 6010B	1 mg/kg	12.75
Zinc Total	EPA 6010B	2 mg/kg	12.75
PESTICIDES AND PCBs			
Atrazine, Total	EPA 507	0.05 mg/kg	150.00
Organochlorine Pesticide and PCB Scan	EPA 8081 and EPA 8082	See Table 4	180.00
		Total Laboratory Cost for Analyzing a Soil Sample	**$611.20**

* Resolution limit.

Table 4. Detection and Reporting Limits for individual parameters included in the Organochlorine Pesticide and PCB Scan of sediment/soil samples.

Parameter	Detection Limit (µg/kg)	Reporting Limit (µg/kg)	Parameter	Detection Limit (µg/kg)	Reporting Limit (µg/kg)
DDE	0.8	9.9	Alpha-BHC (alpha-Lindane)	0.4	5.1
DDD	0.7	9.9	Beta-BHC (beta-Lindane)	1.0	5.1
DDT	1.0	9.9	Delta-BHC (delta-Lindane)	1.8	5.1
Methoxychlor	1.2	5.1	Gamma-BHC (gamma-Lindane)	0.6	5.1
Aldrin	0.7	5.1	Gamma-Chlordane	0.8	5.1
Dieldrin	0.7	9.9	PCB - Aroclor1016	10	50
Endosulfan 1	0.7	5.1	PCB - Aroclor1260	10	50
Endosulfan 2	0.8	9.9	PCB - Aroclor1221	10	50
Endosulfan Sulfate	1.0	9.9	PCB - Aroclor1248	10	50
Endrin	1.0	9.9	PCB - Aroclor1268	10	50
Endrin Aldehyde	1.0	9.9	PCB - Aroclor1232	10	50
Endrin Ketone	0.8	9.9	PCB - Aroclor1254	10	50
Heptachlor	0.6	5.1	PCB - Aroclor1242	10	50
Heptachlor Epoxide	0.8	5.1	PCB - Aroclor1262	10	50
Alpha-Chlordane	0.8	5.1			

Table. 5. Parameters to be Analyzed in Pre-Elutriate Water Samples and Unit Costs.

Parameter*	Method	Detection Limit	Analytical Cost
PHYSICAL AND AGGREGATE PROPERTIES			
Total Suspended Solids	EPA 160.1	5 mg/l	$10.90
Turbidity	EPA 180.1	1 NTU	13.50
NUTRIENTS			
Nitrogen, Ammonia as N,	EPA 350.1	0.02 mg/l	17.70
Nitrogen, Total Kjeldahl as N	EPA 351.3	0.2 mg/l	20.55
Nitrogen, Nitrate/Nitrite as N	EPA 353.2	0.02 mg/l	13.25
Phosphorus, Total	SM4500PF	0.02 mg/l	18.80
AGGREGATE ORGANIC CONSTITUENTS			
CBOD	SM 5210.B	1 mg/l	29.10
Chemical Oxygen Demand	ASTM D1252	3 mg/l	18.20
Organic Carbon, Total	EPA 415.1	0.4 mg/l	26.50
METALS			
Total Metals Scan	EPA 6010B	See Table 6	168.30
Total Laboratory Cost for Analyzing a Pre-Elutriate Water Sample			**$336.80**

Table 6. Detection and Reporting Limits for individual metals included in the Total and Dissolved Metals Scan of analyzed water samples.

Metal	Detection Limit (µg/l)	Reporting Limit (µg/l)	Metal	Detection Limit (µg/l)	Reporting Limit (µg/l)
Aluminum	20	50	Lead	0.5	2
Antimony	0.03	0.5	Magnesium	1,000	3,000
Arsenic	1	3	Manganese	2	10
Beryllium	0.2	1	Mercury	0.02	0.05
Cadmium	0.2	1	Nickel	2	10
Calcium	1,000	3,000	Selenium	0.4	1
Chromium III	4	10	Silver	0.05	1
Copper	2	10	Thallium	0.05	0.5
Iron	5	50	Zinc	2	10

Table 7. Parameters to be Analyzed in Standard Filtered Elutriate Water Samples and Unit Costs.

Parameter	Method	Detection Limit	Analytical Cost
SAMPLE PREPARATION			
Elutriate Sample Preparation	1:4 Sediment:Receiving Water	-----	$178.50
PHYSICAL AND AGGREGATE PROPERTIES			
pH	EPA 150.1	0.1 S.U.*	7.45
NUTRIENTS			
Nitrogen, Ammonia as N	EPA 350.1	0.02 mg/l	17.70
Nitrogen, Nitrate/Nitrite as N (mg/l)	EPA 353.2	0.02 mg/l	13.35
Phosphorus, Dissolved	SM4500PF	0.02 mg/l	18.80
Ortho-Phosphorus, Dissolved	EPA 365.1	0.02 mg/l	14.30
METALS			
Dissolved Metals Scan	EPA 6010B	See Table 6	$168.30
Total Laboratory Cost for Analyzing a Standard Filtered Elutriate Water Sample			**$418.40**

* Resolution limit.

Table. 8. Parameters to be Analyzed in Non-Filtered Elutriate Water Samples and Unit Costs.

Parameter*	Method	Detection Limit	Analytical Cost
PHYSICAL AND AGGREGATE PROPERTIES			
Total Suspended Solids	EPA 160.1	5 mg/l	$10.95
Turbidity	EPA 180.1	1 NTU	13.55
NUTRIENTS			
Nitrogen, Ammonia as N	EPA 350.1	0.02 mg/l	17.70
Nitrogen, Total Kjeldahl as N	EPA 351.3	0.2 mg/l	20.55
Nitrogen, Nitrate-Nitrite as N	EPA 353.2	0.02 mg/l	13.25
Phosphorus, Total	SM4500PF	0.02 mg/l	18.80
AGGREGATE ORGANIC CONSTITUENTS			
CBOD	SM 5210.B	1 mg/l	29.15
Chemical Oxygen Demand	ASTM D1252	3 mg/l	18.20
Organic Carbon, Total	EPA 415.1	0.4 mg/l	26.55
METALS TOTAL			
Total Metals Scan	EPA 6010B	See Table 6	$168.30
PESTICIDES and PCBs			
Atrazine (Immunoassay by Elisa)	Fluorometry	0.1 μg/L	23.50
Organochlorine Pesticide and PCB Scan (ug/l)	EPA 8081 EPA 8082	See Table 9	180.00
Total Laboratory Cost for Analyzing a Pre-Elutriate Water Sample			**$540.50**

Table 9. Detection and Reporting Limits for individual parameters included in the Organochlorine Pesticide and PCB Scan of water samples.

Parameter	Detection Limit (µg/l)	Reporting Limit (µg/l)	Parameter	Detection Limit (µg/l)	Reporting Limit (µg/l)
DDE	0.005	0.1	Alpha-BHC (alpha-Lindane)	0.009	0.05
DDD	0.005	0.1	Beta-BHC (beta-Lindane)	0.009	0.05
DDT	0.004	0.1	Delta-BHC (delta-Lindane)	0.014	0.05
Methoxychlor	0.005	0.5	Gamma-BHC (gamma-Lindane)	0.035	0.05
Aldrin	0.008	0.5	Gamma-Chlordane	0.006	0.05
Dieldrin	0.004	0.1	PCB - Aroclor1016	0.2	1.0
Endosulfan 1	0.006	0.05	PCB - Aroclor1260	0.2	1.0
Endosulfan 2	0.003	0.1	PCB - Aroclor1221	0.2	2.0
Endosulfan Sulfate	0.010	0.1	PCB - Aroclor1248	0.3	1.0
Endrin	0.003	0.1	PCB - Aroclor1268	0.3	1.0
Endrin Aldehyde	0.011	0.1	PCB - Aroclor1232	0.2	1.0
Endrin Ketone	0.006	0.1	PCB - Aroclor1254	0.2	1.0
Heptachlor	0.009	0.05	PCB - Aroclor1242	0.2	1.0
Heptachlor Epoxide	0.007	0.05	PCB - Aroclor1262	0.2	1.0
Alpha-Chlordane	0.011	0.05			

Table 10. Parameters to be Analyzed on Receiving Water Sample and Unit Costs.

Parameter	Method	Detection Limit	Analytical Cost
PHYSICAL AND AGGREGATE PROPERTIES			
Total Suspended Solids	EPA 160.2	5 mg/l	10.90
NUTRIENTS			
Nitrogen, Ammonia as N, Total	EPA 350.1	0.02 mg/l	17.70
Nitrogen, Total Kjeldahl as N	EPA 351.3	0.2 mg/l	20.55
Nitrogen, Nitrate/Nitrite as N	EPA 353.2	0.02 mg/l	13.25
Phosphorus, Dissolved	SM4500PF	0.02 mg/l	18.80
Phosphorus, Total	SM4500PF	0.02 mg/l	18.80
Ortho-Phosphorus, Dissolved	EPA 365.1	0.02 mg/l	14.00
AGGREGATE ORGANIC CONSTITUENTS			
Carbonaceous Biochemical Oxygen Demand - CBOD (mg/l)	SM 5210.B	1 mg/l	29.10
Chemical Oxygen Demand	ASTM D1252	3 mg/l	18.20
Organic Carbon, Total	EPA 415.1	0.4 mg/l	26.50
METALS			
Dissolved Metals Scan	EPA 6010B	See Table 6	168.30
Total Metals Scan	EPA 6010B	See Table 6	168.30
PESTICIDES AND PCBs			
Organochlorine Pesticide and PCB Scan	EPA 8081 EPA 8082	See Table 8	180.00
Atrazine (Immunoassay by Elisa)	Fluorometry	0.1 µg/L	23.50
Total Laboratory Cost for Analyzing the Receiving Water Sample			**$727.90**

5.6. QUALITY CONTROL

5.6.1. Adherence to Standard Operating Procedures and Quality Control Plans

Where applicable, field measurements and samples will be collected in accordance with Standard Operating Procedures (SOP) developed by the Omaha District's Water Control and Water Quality Section.

Laboratory quality control samples and data quality indicators will be utilized in accordance with Midwest Laboratory's Quality Assurance Manual. Routine internal quality control checks are placed in the measurement system to assess the quality of the data generated. These checks typically include: with each preparative batch, a Method Blank, a Matrix Spike and Matrix Spike Duplicate, a Laboratory Duplicate, and a Laboratory Control Sample. Inclusion of the Matrix Spike, Matrix Spike Duplicate and Laboratory Duplicate are contingent on sufficient sample material being provided. In addition to the checks within the preparative batch there are analysis batch checks that are also completed (retained on file by the laboratory, but typically not reported in a standard data package) including Calibration Blanks, Initial Calibration Verifications, and Continuing Calibration Verifications. Additional samples are analyzed periodically (results retained on file) and may include reagent blanks, second source check standards and other performance checks. External quality control checks are provided in the form of Performance and System Audits and Surveillance. A laboratory Quality Assurance Report will be submitted to the District's Water Quality Unit on an appropriate basis.

5.6.2. Data Quality Review

All water quality measurements and analyses will be verified, validated, and compiled in accordance with SOP WQ-27202: Data Quality Review.

6. WATER QUALITY SAMPLING REPORT AND FACTUAL DETERMINATIONS

A Water Quality Sampling Report and Factual Determinations (WQSRFD) will be prepared that provides the results of the elutriate testing conducted on sediment/soil samples collected at the proposed Middle Decatur project site. Elutriate testing results will be evaluated to assess potential impacts the proposed hydraulic dredging at the Middle Decatur site poses to water quality and nutrient loading in the Missouri River. As appropriate, elutriate results will be:

1) Compared to applicable State water quality standards,
2) Evaluated for degradation of existing water quality conditions in the Missouri River, and
3) Compared to current nutrient loadings in the Missouri River.

The prepared WQSRFD will be subject to a "Peer Review/Report Check Certification" prior to release of the report to the public.

7. PROJECTED COSTS FOR LABOR AND LABORATORY ANALYSES

7.1. LABOR: $7,000

Water Control and Water Quality staff time for preparation of Quality Control Plan, Field Collection of identified samples, and preparation of a Water Quality Sampling Report.

7.2. LABORATORY ANALYSES (MIDWEST LABORATORIES): $4,542

Laboratory Analysis (Midwest Laboratories):

Analyzed Media	Number of Samples	Unit Cost per Sample	Total Cost
Soil	2	$611.20	$1,222.40
Pre-Elutriate	2	$336.80	$673.60
Filtered Elutriate	2	$418.40	$836.80
Non-Filtered Elutriate	2	$540.50	$1,081.00
Receiving Water	1	$727.90	$727.90
TOTAL ANALYSTICAL COSTS			**$4,541.70**

8. REFERENCES

Iowa Department of Agricultural and land Stewardship, Iowa Department of natural Resources, and Iowa State University College of Agriculture and Life Sciences. 2012. Iowa Nutrient Strategy – A science and technology-based framework to assess and reduce nutrients to Iowa waters and the Gulf of Mexico. November, 2012. http://www.nutrientstrategy.iastate.edu/

Nebraska Department of Environmental Quality. 2012. Findings of the 2010 Regional Ambient Fish Tissue Program in Nebraska. June 2012. Water Quality Assessment Section, Nebraska Department of Environmental Quality, Lincoln, NE.

USEPA and USACE. 1998. Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S. - Test Manual: Inland Testing Manual. EPA-823-B-98-004, February 1998. U.S. Environmental Protection Agency, Office of Water. Department of Army, U.S. Army Corps of Engineers. Washington, D.C

ATTACHMENT 1. Field Sheet for Middle Decatur Elutriate Monitoring Project.

(U.S. Army Corps of Engineers – Omaha District – Water Quality Unit)

FIELD DATA SHEET

Project Name: Middle Decatur Elutriate Monitoring **Project Number:** SPS-MIDDEC-001

Trip Number: _____ **Date:** _____

Site Location: Middle Decatur SWH Project, Missouri River (RM689)

Site Numbers: MD-W1**,** MD-S1, MD-S2

Collectors: _____

GPS MEASUREMENTS

GPS Device Used: _____

Site MD-W1: Latitude: _____ Longitude: _____

Site MD-S1: Latitude: _____ Longitude: _____

Site MD-S2: Latitude: _____ Longitude: _____

WATER MEASUREMENTS

Water Quality Measurements:

Temp. (°C)	pH (S.U.)	Cond. (umho/cm)	D.O. (mg/L)	D.O. (%Sat)	Turbidity (NTUs)

SAMPLES COLLECTED

Sample Type	Sample ID	Sampled Depth	Collection Time	Sampling Method
Water Sample	MD-W1	Surface		Grab
Soil Sample	MD-S1			Composite Core
Soil Sample	MD-S2			Composite Core

COMMENTS:

ATTACHMENT 2.

Particle Size Distribution Reports for Sediment/Soil Samples Collected in 2013 at the Middle Decatur Shallow Water Habitat Site

Note: Referenced site MD-S2A in main report is location MD-S2 in Attachment 2 and referenced site MD-S2B in main report is location MD-S3 in Attachment 2.

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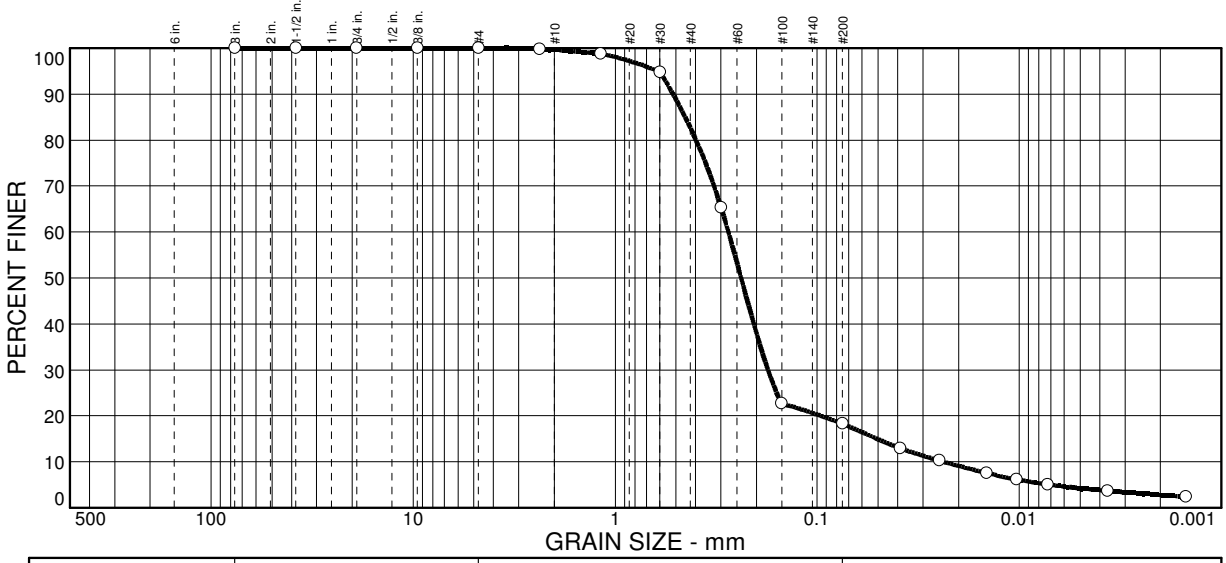
Report Number
13-126-2117

Particle Size Distribution Report

Project: MIDDLE DECATUR SPS-MIDDEC-001 TRIP EDXDEJ042613 **Report No.:** 13-126-2117
Client: US ARMY CORPS OF ENGINEERS

Sample No: 2127034 **Source of Sample:** **Date:** 04/26/13
Location: MD-S1 **Elev./Depth:**



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.4	16.9	64.4	14.0	4.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
1.5 in.	100.0		
.75 in.	100.0		
.375 in.	100.0		
#4	100.0		
#8	99.8		
#16	98.8		
#30	94.8		
#50	65.4		
#100	22.7		
#200	18.3		

* (no specification provided)

Soil Description

Atterberg Limits
PL= LL= PI=

Coefficients
D_{85}= 0.451 D_{60}= 0.276 D_{50}= 0.238
D_{30}= 0.176 D_{15}= 0.0505 D_{10}= 0.0236
C_u= 11.70 C_c= 4.75

Classification
USCS= AASHTO=

Remarks

Figure

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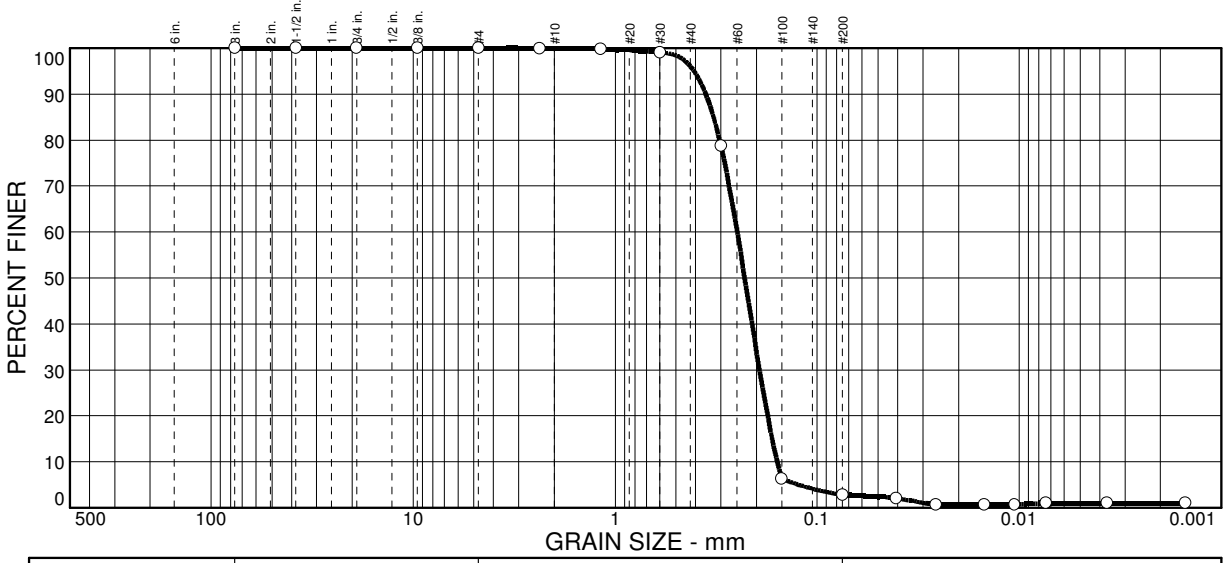
Report Number
13-126-2118

Particle Size Distribution Report

Project: MIDDLE DECATUR SPS-MIDDEC-001 TRIP EDXDEJ042613 **Report No.:** 13-126-2118
Client: US ARMY CORPS OF ENGINEERS

Sample No: 2127035 **Source of Sample:** **Date:** 04/26/13
Location: MD-S2 **Elev./Depth:**



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.1	3.8	93.3	1.8	1.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
1.5 in.	100.0		
.75 in.	100.0		
.375 in.	100.0		
#4	100.0		
#8	99.9		
#16	99.8		
#30	99.1		
#50	78.7		
#100	6.3		
#200	2.8		

* (no specification provided)

Soil Description

Atterberg Limits
PL= LL= PI=

Coefficients
D_{85}= 0.327 D_{60}= 0.249 D_{50}= 0.229
D_{30}= 0.193 D_{15}= 0.168 D_{10}= 0.158
C_u= 1.58 C_c= 0.95

Classification
USCS= AASHTO=

Remarks

Figure

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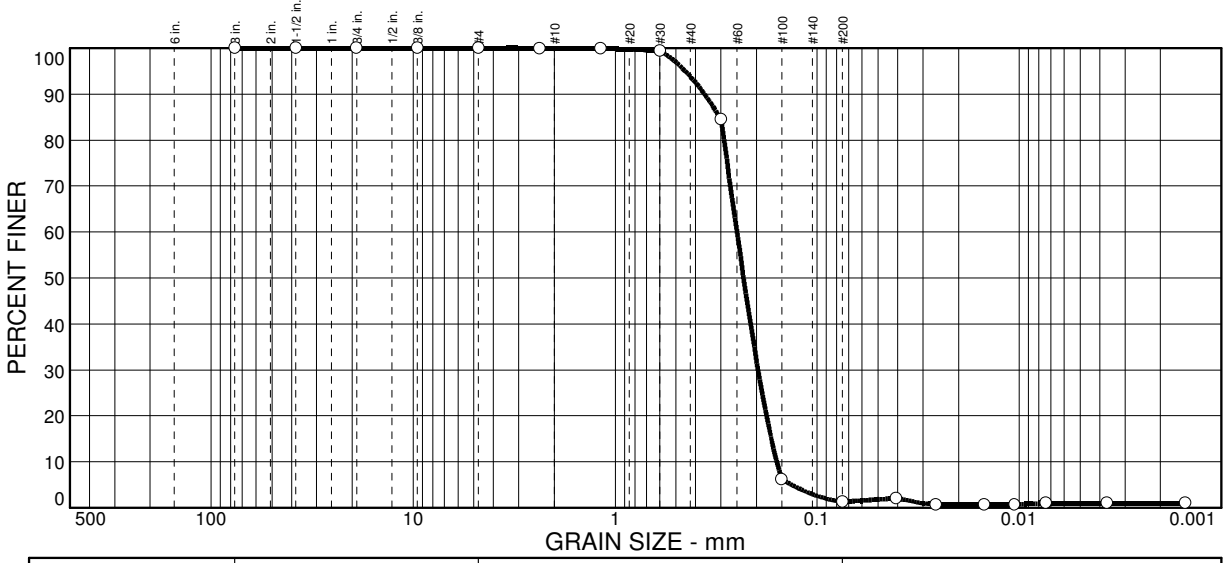
Report Number
13-126-2119

Particle Size Distribution Report

Project: MIDDLE DECATUR SPS-MIDDEC-001 TRIP EDXDEJ042613 **Report No.:** 13-126-2119
Client: US ARMY CORPS OF ENGINEERS

Sample No: 2127036 **Source of Sample:** **Date:** 04/26/13
Location: MD-S3 **Elev./Depth:**



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.1	6.1	92.5	0.3	1.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
1.5 in.	100.0		
.75 in.	100.0		
.375 in.	100.0		
#4	100.0		
#8	99.9		
#16	99.9		
#30	99.4		
#50	84.5		
#100	6.2		
#200	1.3		

* (no specification provided)

Soil Description

Atterberg Limits
PL= LL= PI=

Coefficients
D_{85}= 0.305 D_{60}= 0.250 D_{50}= 0.232
D_{30}= 0.197 D_{15}= 0.169 D_{10}= 0.159
C_u= 1.58 C_c= 0.97

Classification
USCS= AASHTO=

Remarks

Figure

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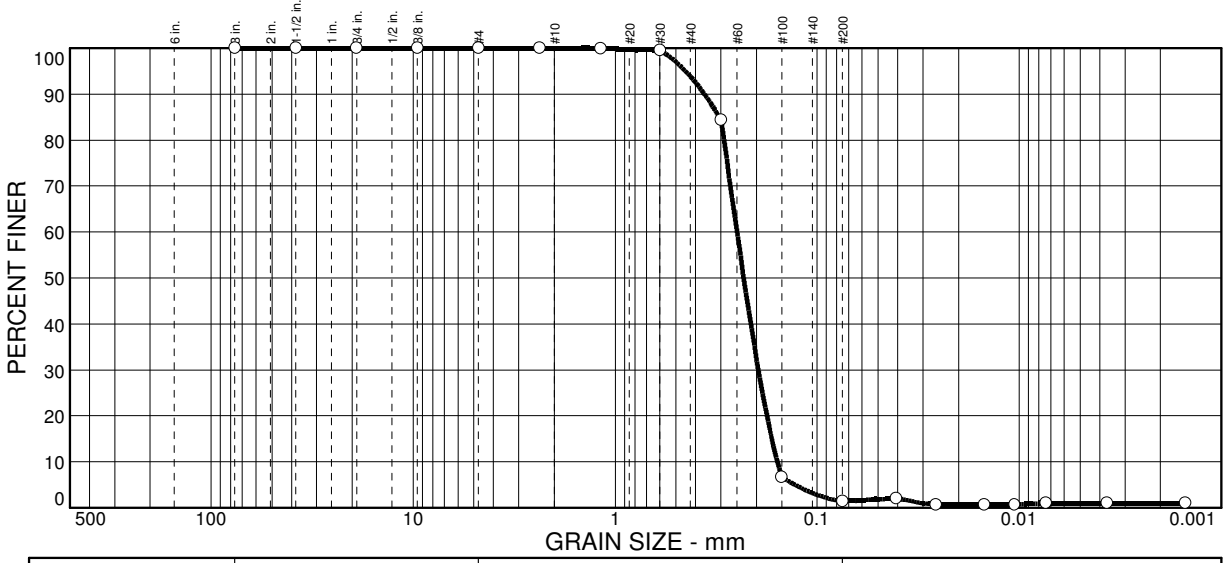
Report Number
13-126-2119

Particle Size Distribution Report

Project: MIDDLE DECATUR SPS-MIDDEC-001 TRIP EDXDEJ042613 **Report No.:** 13-126-2119
Client: US ARMY CORPS OF ENGINEERS

Sample No: 2127036 DUP **Source of Sample:** **Date:** 04/26/13
Location: MD-S3 DUP **Elev./Depth:**



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.0	6.1	92.5	0.4	1.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
1.5 in.	100.0		
.75 in.	100.0		
.375 in.	100.0		
#4	100.0		
#8	100.0		
#16	99.9		
#30	99.5		
#50	84.4		
#100	6.7		
#200	1.4		

* (no specification provided)

Soil Description

Atterberg Limits
PL= LL= PI=

Coefficients
D_{85}= 0.306 D_{60}= 0.250 D_{50}= 0.232
D_{30}= 0.196 D_{15}= 0.168 D_{10}= 0.158
C_u= 1.58 C_c= 0.97

Classification
USCS= AASHTO=

Remarks

Figure

ATTACHMENT 3.

Laboratory Report of 2013 Results for Analysis of Collected Sediment/Soil, Receiving Water, and Prepared Pre-Elutriate and Elutriate Samples at the Proposed Middle Decatur Shallow Water Habitat Site

Station	Date	SampleSource	Analyte	Result	Units	Qual	Method	DF	MDL	MRL
MD-S1	29-Apr-13	FILTERED ELUTRIATE	Aluminum (Dissolved)	0.09	mg/L	J	EPA 200.7	2	0.03	0.1
MD-S2A	29-Apr-13	FILTERED ELUTRIATE	Aluminum (Dissolved)	0.08	mg/L	J	EPA 200.7	2	0.03	0.1
MD-W1	29-Apr-13	RECEIVING WATER	Aluminum (Dissolved)	<0.03	mg/L	U	EPA 200.7	2	0.03	0.1
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	Aluminum (Total)	12.58	mg/L		EPA 200.7	2	0.03	0.1
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	Aluminum (Total)	9.01	mg/L		EPA 200.7	2	0.03	0.1
MD-S1	29-Apr-13	PRE ELUTRIATE	Aluminum (Total)	260.1	mg/L		EPA 200.7	2	0.03	0.1
MD-S2A	29-Apr-13	PRE ELUTRIATE	Aluminum (Total)	92.89	mg/L		EPA 200.7	2	0.03	0.1
MD-W1	29-Apr-13	RECEIVING WATER	Aluminum (Total)	1.44	mg/L		EPA 200.7	2	0.03	0.1
MD-S1	29-Apr-13	FILTERED ELUTRIATE	Ammonia as N	0.63	mg/L		SM 4500-NH3 G	1	0.02	0.1
MD-S2A	29-Apr-13	FILTERED ELUTRIATE	Ammonia as N	0.03	mg/L	J	SM 4500-NH3 G	1	0.02	0.1
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	Ammonia as N	0.63	mg/L		SM 4500-NH3 G	1	0.02	0.1
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	Ammonia as N	0.04	mg/L	J	SM 4500-NH3 G	1	0.02	0.1
MD-S1	29-Apr-13	PRE ELUTRIATE	Ammonia as N	<0.10	mg/L		SM 4500-NH3 C-1997	5	0.1	0.5
MD-S2A	29-Apr-13	PRE ELUTRIATE	Ammonia as N	<0.10	mg/L		SM 4500-NH3 C-1997	5	0.1	0.5
MD-W1	29-Apr-13	RECEIVING WATER	Ammonia as N	0.06	mg/L	J	SM 4500-NH3 G	1	0.02	0.1
MD-S1	26-Apr-13	SEDIMENT	Ammonia as N	3.4	mg/kg dry		SM 4500-NH3 G	5		1.1
MD-S2A	26-Apr-13	SEDIMENT	Ammonia as N	1.3	mg/kg dry		SM 4500-NH3 G	5		1.1
MD-S2B	26-Apr-13	SEDIMENT	Ammonia as N	1.4	mg/kg dry		SM 4500-NH3 G	5		1.1
MD-S1	29-Apr-13	FILTERED ELUTRIATE	Antimony (Dissolved)	0.0009	mg/L	J	EPA 200.8	2	0.00006	0.001
MD-S2A	29-Apr-13	FILTERED ELUTRIATE	Antimony (Dissolved)	<0.0000600	mg/L	U	EPA 200.8	2	0.00006	0.001
MD-W1	29-Apr-13	RECEIVING WATER	Antimony (Dissolved)	<0.0000600	mg/L	U	EPA 200.8	2	0.00006	0.001
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	Antimony (Total)	<0.0000600	mg/L	U	EPA 200.8	2	0.00006	0.001
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	Antimony (Total)	<0.0000600	mg/L	U	EPA 200.8	2	0.00006	0.001
MD-S1	29-Apr-13	PRE ELUTRIATE	Antimony (Total)	0.0011	mg/L		EPA 200.8	2	0.00006	0.001
MD-S2A	29-Apr-13	PRE ELUTRIATE	Antimony (Total)	0.0019	mg/L		EPA 200.8	2	0.00006	0.001
MD-W1	29-Apr-13	RECEIVING WATER	Antimony (Total)	0.0002	mg/L	J	EPA 200.8	1	0.00003	0.0005
MD-S1	29-Apr-13	FILTERED ELUTRIATE	Arsenic (Dissolved)	0.001	mg/L	J	EPA 200.8	2	0.0003	0.002
MD-S2A	29-Apr-13	FILTERED ELUTRIATE	Arsenic (Dissolved)	0.002	mg/L	J	EPA 200.8	2	0.0003	0.002
MD-W1	29-Apr-13	RECEIVING WATER	Arsenic (Dissolved)	0.002	mg/L		EPA 200.8	2	0.0003	0.002
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	Arsenic (Total)	0.007	mg/L		EPA 200.8	2	0.0003	0.002
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	Arsenic (Total)	0.01	mg/L		EPA 200.8	2	0.0003	0.002
MD-S1	29-Apr-13	PRE ELUTRIATE	Arsenic (Total)	0.197	mg/L		EPA 200.8	2	0.0003	0.002
MD-S2A	29-Apr-13	PRE ELUTRIATE	Arsenic (Total)	0.156	mg/L		EPA 200.8	2	0.0003	0.002
MD-W1	29-Apr-13	RECEIVING WATER	Arsenic (Total)	0.003	mg/L		EPA 200.8	1	0.0002	0.001
MD-S1	26-Apr-13	SEDIMENT	Arsenic (Total)	4.7	mg/kg dry		EPA 6020	100	0.01	0.5
MD-S2A	26-Apr-13	SEDIMENT	Arsenic (Total)	6.3	mg/kg dry		EPA 6020	100	0.01	0.5
MD-S2B	26-Apr-13	SEDIMENT	Arsenic (Total)	5.7	mg/kg dry		EPA 6020	100	0.01	0.5
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	Atrazine	<0.08	ug/L	U	NEP	1.03093	0.08	0.5
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	Atrazine	<0.08	ug/L	U	NEP	1.07527	0.08	0.5
MD-W1	29-Apr-13	RECEIVING WATER	Atrazine	<0.08	ug/L	U	NEP	1.1236	0.08	0.5
MD-S1	26-Apr-13	SEDIMENT	Atrazine	<0.002	ug/g	U	NEP	1	0.002	0.05
MD-S2A	26-Apr-13	SEDIMENT	Atrazine	<0.002	ug/g	U	NEP	1	0.002	0.05
MD-S2B	26-Apr-13	SEDIMENT	Atrazine	<0.002	ug/g	U	NEP	1	0.002	0.05
MD-S1	29-Apr-13	FILTERED ELUTRIATE	Beryllium (Dissolved)	0.001	mg/L	J	EPA 200.7	2	0.0004	0.002
MD-S2A	29-Apr-13	FILTERED ELUTRIATE	Beryllium (Dissolved)	<0.0004	mg/L	U	EPA 200.7	2	0.0004	0.002

Station	Date	SampleSource	Analyte	Result	Units	Qual	Method	DF	MDL	MRL
MD-W1	29-Apr-13	RECEIVING WATER	Beryllium (Dissolved)	0.001	mg/L	J	EPA 200.7	2	0.0004	0.002
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	Beryllium (Total)	0.0005	mg/L	J	EPA 200.7	2	0.0004	0.002
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	Beryllium (Total)	0.0006	mg/L	J	EPA 200.7	2	0.0004	0.002
MD-S1	29-Apr-13	PRE ELUTRIATE	Beryllium (Total)	0.013	mg/L		EPA 200.7	2	0.0004	0.002
MD-S2A	29-Apr-13	PRE ELUTRIATE	Beryllium (Total)	0.005	mg/L		EPA 200.7	2	0.0004	0.002
MD-W1	29-Apr-13	RECEIVING WATER	Beryllium (Total)	0.001	mg/L	J	EPA 200.7	2	0.0004	0.002
MD-S1	29-Apr-13	FILTERED ELUTRIATE	Cadmium (Dissolved)	<0.0000200	mg/L	U	EPA 200.8	2	0.00002	0.001
MD-S2A	29-Apr-13	FILTERED ELUTRIATE	Cadmium (Dissolved)	<0.0000200	mg/L	U	EPA 200.8	2	0.00002	0.001
MD-W1	29-Apr-13	RECEIVING WATER	Cadmium (Dissolved)	<0.0000200	mg/L	U	EPA 200.8	2	0.00002	0.001
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	Cadmium (Total)	<0.0000200	mg/L	U	EPA 200.8	2	0.00002	0.001
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	Cadmium (Total)	<0.0000200	mg/L	U	EPA 200.8	2	0.00002	0.001
MD-S1	29-Apr-13	PRE ELUTRIATE	Cadmium (Total)	0.0132	mg/L		EPA 200.8	2	0.00002	0.001
MD-S2A	29-Apr-13	PRE ELUTRIATE	Cadmium (Total)	0.0055	mg/L		EPA 200.8	2	0.00002	0.001
MD-W1	29-Apr-13	RECEIVING WATER	Cadmium (Total)	0.0002	mg/L	J	EPA 200.8	1	0.00001	0.0005
MD-S1	26-Apr-13	SEDIMENT	Cadmium (Total)	0.12	mg/kg dry		EPA 6020	100	0.002	0.05
MD-S2A	26-Apr-13	SEDIMENT	Cadmium (Total)	0.13	mg/kg dry		EPA 6020	100	0.002	0.05
MD-S2B	26-Apr-13	SEDIMENT	Cadmium (Total)	0.1	mg/kg dry		EPA 6020	100	0.002	0.05
MD-S1	29-Apr-13	FILTERED ELUTRIATE	Calcium (Dissolved)	87.5	mg/L		EPA 200.7	2	0.14	0.2
MD-S2A	29-Apr-13	FILTERED ELUTRIATE	Calcium (Dissolved)	79.68	mg/L		EPA 200.7	2	0.14	0.2
MD-W1	29-Apr-13	RECEIVING WATER	Calcium (Dissolved)	73.38	mg/L		EPA 200.7	2	0.14	0.2
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	Calcium (Total)	88.65	mg/L		EPA 200.7	2	0.14	0.2
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	Calcium (Total)	80.02	mg/L		EPA 200.7	2	0.14	0.2
MD-S1	29-Apr-13	PRE ELUTRIATE	Calcium (Total)	553.9	mg/L		EPA 200.7	2	0.14	0.2
MD-S2A	29-Apr-13	PRE ELUTRIATE	Calcium (Total)	255.6	mg/L		EPA 200.7	2	0.14	0.2
MD-W1	29-Apr-13	RECEIVING WATER	Calcium (Total)	75.24	mg/L		EPA 200.7	2	0.14	0.2
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	Carbonaceous BOD	1	mg/L	J	SM 5210 B-2001	1	0.6	2
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	Carbonaceous BOD	1	mg/L	J	SM 5210 B-2001	1	0.6	2
MD-S1	29-Apr-13	PRE ELUTRIATE	Carbonaceous BOD	6	mg/L		SM 5210 B-2001	1	0.6	2
MD-S2A	29-Apr-13	PRE ELUTRIATE	Carbonaceous BOD	1	mg/L	J	SM 5210 B-2001	1	0.6	2
MD-W1	29-Apr-13	RECEIVING WATER	Carbonaceous BOD	2	mg/L	J	SM 5210 B-2001	1	0.6	2
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	Chemical Oxygen Demand	16	mg/L		ASTM D1252-95-B	1	2	5
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	Chemical Oxygen Demand	12	mg/L		ASTM D1252-95-B	1	2	5
MD-S1	29-Apr-13	PRE ELUTRIATE	Chemical Oxygen Demand	516	mg/L		ASTM D1252-95-B	25	47	125
MD-S2A	29-Apr-13	PRE ELUTRIATE	Chemical Oxygen Demand	46	mg/L		ASTM D1252-95-B	1	2	5
MD-W1	29-Apr-13	RECEIVING WATER	Chemical Oxygen Demand	11	mg/L		ASTM D1252-95-B	1	2	5
MD-S1	29-Apr-13	FILTERED ELUTRIATE	Chromium (Dissolved)	0.004	mg/L	J	EPA 200.7	2	0.002	0.02
MD-S2A	29-Apr-13	FILTERED ELUTRIATE	Chromium (Dissolved)	0.002	mg/L	J	EPA 200.7	2	0.002	0.02
MD-W1	29-Apr-13	RECEIVING WATER	Chromium (Dissolved)	<0.002	mg/L	U	EPA 200.7	2	0.002	0.02
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	Chromium (Total)	0.02	mg/L	J	EPA 200.7	2	0.002	0.02
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	Chromium (Total)	0.02	mg/L		EPA 200.7	2	0.002	0.02
MD-S1	29-Apr-13	PRE ELUTRIATE	Chromium (Total)	0.41	mg/L		EPA 200.7	2	0.002	0.02
MD-S2A	29-Apr-13	PRE ELUTRIATE	Chromium (Total)	0.26	mg/L		EPA 200.7	2	0.002	0.02
MD-W1	29-Apr-13	RECEIVING WATER	Chromium (Total)	<0.002	mg/L	U	EPA 200.7	2	0.002	0.02
MD-S1	26-Apr-13	SEDIMENT	Chromium (Total)	7.2	mg/kg dry		EPA 6010B	53.65	0.2	0.6
MD-S2A	26-Apr-13	SEDIMENT	Chromium (Total)	5	mg/kg dry		EPA 6010B	51.28	0.2	0.5

Station	Date	SampleSource	Analyte	Result	Units	Qual	Method	DF	MDL	MRL
MD-S2B	26-Apr-13	SEDIMENT	Chromium (Total)	5.3	mg/kg dry		EPA 6010B	53.33	0.2	0.6
MD-S1	29-Apr-13	FILTERED ELUTRIATE	Copper (Dissolved)	0.006	mg/L	J	EPA 200.7	2	0.004	0.02
MD-S2A	29-Apr-13	FILTERED ELUTRIATE	Copper (Dissolved)	0.006	mg/L	J	EPA 200.7	2	0.004	0.02
MD-W1	29-Apr-13	RECEIVING WATER	Copper (Dissolved)	0.005	mg/L	J	EPA 200.7	2	0.004	0.02
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	Copper (Total)	0.01	mg/L	J	EPA 200.7	2	0.004	0.02
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	Copper (Total)	0.01	mg/L	J	EPA 200.7	2	0.004	0.02
MD-S1	29-Apr-13	PRE ELUTRIATE	Copper (Total)	0.38	mg/L		EPA 200.7	2	0.004	0.02
MD-S2A	29-Apr-13	PRE ELUTRIATE	Copper (Total)	0.16	mg/L		EPA 200.7	2	0.004	0.02
MD-W1	29-Apr-13	RECEIVING WATER	Copper (Total)	0.006	mg/L	J	EPA 200.7	2	0.004	0.02
MD-S1	26-Apr-13	SEDIMENT	Copper (Total)	5.1	mg/kg dry		EPA 6010B	53.65	0.08	0.6
MD-S2A	26-Apr-13	SEDIMENT	Copper (Total)	2.4	mg/kg dry		EPA 6010B	51.28	0.07	0.5
MD-S2B	26-Apr-13	SEDIMENT	Copper (Total)	2.5	mg/kg dry		EPA 6010B	53.33	0.07	0.6
MD-S1	29-Apr-13	FILTERED ELUTRIATE	Iron (Dissolved)	0.06	mg/L	J	EPA 200.7	2	0.01	0.1
MD-S2A	29-Apr-13	FILTERED ELUTRIATE	Iron (Dissolved)	0.01	mg/L	J	EPA 200.7	2	0.01	0.1
MD-W1	29-Apr-13	RECEIVING WATER	Iron (Dissolved)	0.01	mg/L	J	EPA 200.7	2	0.01	0.1
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	Iron (Total)	13.82	mg/L		EPA 200.7	2	0.01	0.1
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	Iron (Total)	13.14	mg/L		EPA 200.7	2	0.01	0.1
MD-S1	29-Apr-13	PRE ELUTRIATE	Iron (Total)	463.7	mg/L		EPA 200.7	20	0.1	1
MD-S2A	29-Apr-13	PRE ELUTRIATE	Iron (Total)	246.3	mg/L		EPA 200.7	20	0.1	1
MD-W1	29-Apr-13	RECEIVING WATER	Iron (Total)	1.52	mg/L		EPA 200.7	2	0.01	0.1
MD-S1	29-Apr-13	FILTERED ELUTRIATE	Lead (Dissolved)	0.2	ug/L	J	EPA 200.8	1	0.09	0.5
MD-S2	29-Apr-13	FILTERED ELUTRIATE	Lead (Dissolved)	0.3	ug/L	J	EPA 200.8	1	0.09	0.5
MD-W1	29-Apr-13	RECEIVING WATER	Lead (Dissolved)	<0.09	ug/L	U	EPA 200.8	1	0.09	0.5
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	Lead (Total)	7.6	ug/L		EPA 200.8	1	0.09	0.5
MD-S2	29-Apr-13	NON FILTERED ELUTRIATE	Lead (Total)	7.9	ug/L		EPA 200.8	1	0.09	0.5
MD-S1	29-Apr-13	PRE ELUTRIATE	Lead (Total)	268.2	ug/L		EPA 200.8	1	0.09	0.5
MD-S2	29-Apr-13	PRE ELUTRIATE	Lead (Total)	144.3	ug/L		EPA 200.8	1	0.09	0.5
MD-W1	29-Apr-13	RECEIVING WATER	Lead (Total)	1	ug/L		EPA 200.8	1	0.09	0.5
MD-S1	26-Apr-13	SEDIMENT	Lead (Total)	5.9	mg/kg dry		EPA 6010B	53.65	0.9	2.9
MD-S2A	26-Apr-13	SEDIMENT	Lead (Total)	4.8	mg/kg dry		EPA 6010B	51.28	0.8	2.7
MD-S2B	26-Apr-13	SEDIMENT	Lead (Total)	4.8	mg/kg dry		EPA 6010B	53.33	0.8	2.8
MD-S1	29-Apr-13	FILTERED ELUTRIATE	Magnesium (Dissolved)	26.86	mg/L		EPA 200.7	2	0.03	0.2
MD-S2A	29-Apr-13	FILTERED ELUTRIATE	Magnesium (Dissolved)	27.49	mg/L		EPA 200.7	2	0.03	0.2
MD-W1	29-Apr-13	RECEIVING WATER	Magnesium (Dissolved)	28.64	mg/L		EPA 200.7	2	0.03	0.2
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	Magnesium (Total)	29	mg/L		EPA 200.7	2	0.03	0.2
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	Magnesium (Total)	28.64	mg/L		EPA 200.7	2	0.03	0.2
MD-S1	29-Apr-13	PRE ELUTRIATE	Magnesium (Total)	176.4	mg/L		EPA 200.7	2	0.03	0.2
MD-S2A	29-Apr-13	PRE ELUTRIATE	Magnesium (Total)	71.92	mg/L		EPA 200.7	2	0.03	0.2
MD-W1	29-Apr-13	RECEIVING WATER	Magnesium (Total)	29.14	mg/L		EPA 200.7	2	0.03	0.2
MD-S1	29-Apr-13	FILTERED ELUTRIATE	Manganese (Dissolved)	<0.004	mg/L	U	EPA 200.7	2	0.004	0.02
MD-S2A	29-Apr-13	FILTERED ELUTRIATE	Manganese (Dissolved)	<0.004	mg/L	U	EPA 200.7	2	0.004	0.02
MD-W1	29-Apr-13	RECEIVING WATER	Manganese (Dissolved)	<0.004	mg/L	U	EPA 200.7	2	0.004	0.02
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	Manganese (Total)	0.37	mg/L		EPA 200.7	2	0.004	0.02
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	Manganese (Total)	0.32	mg/L		EPA 200.7	2	0.004	0.02
MD-S1	29-Apr-13	PRE ELUTRIATE	Manganese (Total)	26.2	mg/L		EPA 200.7	2	0.004	0.02

Station	Date	SampleSource	Analyte	Result	Units	Qual	Method	DF	MDL	MRL
MD-S2A	29-Apr-13	PRE ELUTRIATE	Manganese (Total)	8.42	mg/L		EPA 200.7	2	0.004	0.02
MD-W1	29-Apr-13	RECEIVING WATER	Manganese (Total)	0.14	mg/L		EPA 200.7	2	0.004	0.02
MD-S1	29-Apr-13	FILTERED ELUTRIATE	Mercury (Dissolved)	<0.0000080	mg/L	U	EPA 245.1	1	0.000008	0.0004
MD-S2A	29-Apr-13	FILTERED ELUTRIATE	Mercury (Dissolved)	<0.0000080	mg/L	U	EPA 245.1	1	0.000008	0.0004
MD-W1	29-Apr-13	RECEIVING WATER	Mercury (Dissolved)	<0.0000080	mg/L	U	EPA 245.1	1	0.000008	0.0004
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	Mercury (Total)	<0.0000080	mg/L	U	EPA 245.1	1	0.000008	0.0004
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	Mercury (Total)	0.00001	mg/L	J	EPA 245.1	1	0.000008	0.0004
MD-S1	29-Apr-13	PRE ELUTRIATE	Mercury (Total)	0.0005	mg/L		EPA 245.1	1	0.000008	0.0004
MD-S2A	29-Apr-13	PRE ELUTRIATE	Mercury (Total)	0.0002	mg/L	J	EPA 245.1	1	0.000008	0.0004
MD-W1	29-Apr-13	RECEIVING WATER	Mercury (Total)	<0.0000080	mg/L	U	EPA 245.1	1	0.000008	0.0004
MD-S1	26-Apr-13	SEDIMENT	Mercury (Total)	0.006	mg/kg dry	J	EPA 7471	200	0.002	0.05
MD-S2A	26-Apr-13	SEDIMENT	Mercury (Total)	0.007	mg/kg dry	J	EPA 7471	200	0.002	0.05
MD-S2B	26-Apr-13	SEDIMENT	Mercury (Total)	0.009	mg/kg dry	J	EPA 7471	200	0.002	0.05
MD-S1	29-Apr-13	FILTERED ELUTRIATE	Nickel (Dissolved)	<0.004	mg/L	U	EPA 200.7	2	0.004	0.02
MD-S2A	29-Apr-13	FILTERED ELUTRIATE	Nickel (Dissolved)	<0.004	mg/L	U	EPA 200.7	2	0.004	0.02
MD-W1	29-Apr-13	RECEIVING WATER	Nickel (Dissolved)	0.006	mg/L	J	EPA 200.7	2	0.004	0.02
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	Nickel (Total)	0.02	mg/L	J	EPA 200.7	2	0.004	0.02
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	Nickel (Total)	0.03	mg/L		EPA 200.7	2	0.004	0.02
MD-S1	29-Apr-13	PRE ELUTRIATE	Nickel (Total)	0.55	mg/L		EPA 200.7	2	0.004	0.02
MD-S2A	29-Apr-13	PRE ELUTRIATE	Nickel (Total)	0.37	mg/L		EPA 200.7	2	0.004	0.02
MD-W1	29-Apr-13	RECEIVING WATER	Nickel (Total)	<0.004	mg/L	U	EPA 200.7	2	0.004	0.02
MD-S1	26-Apr-13	SEDIMENT	Nickel (Total)	10.7	mg/kg dry		EPA 6010B	53.65	0.2	0.6
MD-S2A	26-Apr-13	SEDIMENT	Nickel (Total)	10.7	mg/kg dry		EPA 6010B	51.28	0.2	0.5
MD-S2B	26-Apr-13	SEDIMENT	Nickel (Total)	10.5	mg/kg dry		EPA 6010B	53.33	0.2	0.6
MD-S1	29-Apr-13	FILTERED ELUTRIATE	Nitrate/Nitrite Nitrogen	0.7	mg/L		EPA 353.2	1	0.02	0.2
MD-S2A	29-Apr-13	FILTERED ELUTRIATE	Nitrate/Nitrite Nitrogen	0.6	mg/L		EPA 353.2	1	0.02	0.2
MD-S1	29-Apr-13	PRE ELUTRIATE	Nitrate/Nitrite Nitrogen	1.4	mg/L		EPA 353.2	1	0.02	0.2
MD-S2A	29-Apr-13	PRE ELUTRIATE	Nitrate/Nitrite Nitrogen	0.67	mg/L		EPA 353.2	1	0.02	0.2
MD-W1	29-Apr-13	RECEIVING WATER	Nitrate/Nitrite Nitrogen	0.53	mg/L		EPA 353.2	1	0.02	0.2
MD-S1	26-Apr-13	SEDIMENT	Nitrate/Nitrite Nitrogen	0.5	mg/kg dry	J	EPA 353.2	5	0.04	1.1
MD-S2A	26-Apr-13	SEDIMENT	Nitrate/Nitrite Nitrogen	<0.04	mg/kg dry	U	EPA 353.2	5	0.04	1.1
MD-S2B	26-Apr-13	SEDIMENT	Nitrate/Nitrite Nitrogen	3.9	mg/kg dry		EPA 353.2	5	0.04	1.1
MD-S1	29-Apr-13	FILTERED ELUTRIATE	Orthophosphate (Dissolved)	0.02	mg/L	J	SM 4500-P G-1999	1	0.005	0.05
MD-S2A	29-Apr-13	FILTERED ELUTRIATE	Orthophosphate (Dissolved)	0.03	mg/L	J	SM 4500-P G-1999	1	0.005	0.05
MD-W1	29-Apr-13	RECEIVING WATER	Orthophosphate (Dissolved)	0.05	mg/L	J	SM 4500-P G-1999	1	0.005	0.05
MD-S1	26-Apr-13	SEDIMENT	Percent Solids	92.34	%		SM 2540 G	1	0.01	0.01
MD-S2A	26-Apr-13	SEDIMENT	Percent Solids	94.55	%		SM 2540 G	1	0.01	0.01
MD-S2B	26-Apr-13	SEDIMENT	Percent Solids	94.93	%		SM 2540 G	1	0.01	0.01
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	pH	8.16	S.U.		SM 4500-H B-2000	1		
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	pH	8.21	S.U.		SM 4500-H B-2000	1		
MD-S1	29-Apr-13	PRE ELUTRIATE	pH	7.72	S.U.		SM 4500-H B-2000	1		
MD-S2A	29-Apr-13	PRE ELUTRIATE	pH	8.14	S.U.		SM 4500-H B-2000	1		
MD-W1	29-Apr-13	RECEIVING WATER	pH	8.3	S.U.		SM 4500-H B-2000	1		
MD-S1	26-Apr-13	SEDIMENT	pH	7.76	S.U.		EPA 9045	1		
MD-S2A	26-Apr-13	SEDIMENT	pH	8.17	S.U.		EPA 9045	1		

Station	Date	SampleSource	Analyte	Result	Units	Qual	Method	DF	MDL	MRL
MD-S2B	26-Apr-13	SEDIMENT	pH	8.15	S.U.		EPA 9045	1		
MD-S1	29-Apr-13	FILTERED ELUTRIATE	Phosphorus (Total Dissolved)	0.009	mg/L	J	SM 4500-P H-1999	1	0.008	0.05
MD-S2A	29-Apr-13	FILTERED ELUTRIATE	Phosphorus (Total Dissolved)	0.03	mg/L	J	SM 4500-P H-1999	1	0.008	0.05
MD-W1	29-Apr-13	RECEIVING WATER	Phosphorus (Total Dissolved)	0.03	mg/L	J	SM 4500-P H-1999	1	0.008	0.05
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	Phosphorus (Total)	0.36	mg/L		SM 4500-P H-1999	1	0.008	0.05
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	Phosphorus (Total)	0.33	mg/L		SM 4500-P H-1999	1	0.008	0.05
MD-S1	29-Apr-13	PRE ELUTRIATE	Phosphorus (Total)	15.9	mg/L		SM 4500-P H-1999	10	0.08	0.5
MD-S2A	29-Apr-13	PRE ELUTRIATE	Phosphorus (Total)	5.64	mg/L		SM 4500-P H-1999	20	0.16	1
MD-W1	29-Apr-13	RECEIVING WATER	Phosphorus (Total)	0.11	mg/L		SM 4500-P H-1999	1	0.008	0.05
MD-S1	26-Apr-13	SEDIMENT	Phosphorus (Total)	406	mg/kg dry		EPA 6010B	53.65	1	5.8
MD-S2A	26-Apr-13	SEDIMENT	Phosphorus (Total)	302.7	mg/kg dry		EPA 6010B	51.28	0.9	5.4
MD-S2B	26-Apr-13	SEDIMENT	Phosphorus (Total)	293.4	mg/kg dry		EPA 6010B	53.33	1	5.6
MD-S1	29-Apr-13	FILTERED ELUTRIATE	Selenium (Dissolved)	0.003	mg/L		EPA 200.8	2	0.0007	0.002
MD-S2A	29-Apr-13	FILTERED ELUTRIATE	Selenium (Dissolved)	0.003	mg/L		EPA 200.8	2	0.0007	0.002
MD-W1	29-Apr-13	RECEIVING WATER	Selenium (Dissolved)	0.002	mg/L		EPA 200.8	2	0.0007	0.002
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	Selenium (Total)	0.004	mg/L		EPA 200.8	2	0.0007	0.002
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	Selenium (Total)	0.003	mg/L		EPA 200.8	2	0.0007	0.002
MD-S1	29-Apr-13	PRE ELUTRIATE	Selenium (Total)	0.026	mg/L		EPA 200.8	2	0.0007	0.002
MD-S2A	29-Apr-13	PRE ELUTRIATE	Selenium (Total)	0.013	mg/L		EPA 200.8	2	0.0007	0.002
MD-W1	29-Apr-13	RECEIVING WATER	Selenium (Total)	0.003	mg/L		EPA 200.8	1	0.0004	0.001
MD-S1	29-Apr-13	FILTERED ELUTRIATE	Silver (Dissolved)	<0.004	mg/L	U	EPA 200.7	2	0.004	0.02
MD-S2A	29-Apr-13	FILTERED ELUTRIATE	Silver (Dissolved)	<0.004	mg/L	U	EPA 200.7	2	0.004	0.02
MD-W1	29-Apr-13	RECEIVING WATER	Silver (Dissolved)	0.004	mg/L	J	EPA 200.7	2	0.004	0.02
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	Silver (Total)	<0.004	mg/L	U	EPA 200.7	2	0.004	0.02
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	Silver (Total)	<0.004	mg/L	U	EPA 200.7	2	0.004	0.02
MD-S1	29-Apr-13	PRE ELUTRIATE	Silver (Total)	<0.004	mg/L	U	EPA 200.7	2	0.004	0.02
MD-S2A	29-Apr-13	PRE ELUTRIATE	Silver (Total)	0.005	mg/L	J	EPA 200.7	2	0.004	0.02
MD-W1	29-Apr-13	RECEIVING WATER	Silver (Total)	<0.004	mg/L	U	EPA 200.7	2	0.004	0.02
MD-S1	29-Apr-13	FILTERED ELUTRIATE	Thallium (Dissolved)	<0.005	ug/L		EPA 200.8	1	0.005	0.5
MD-S2	29-Apr-13	FILTERED ELUTRIATE	Thallium (Dissolved)	<0.005	ug/L		EPA 200.8	1	0.005	0.5
MD-W1	29-Apr-13	RECEIVING WATER	Thallium (Dissolved)	<0.005	ug/L		EPA 200.8	1	0.005	0.5
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	Thallium (Total)	<0.005	ug/L	U	EPA 200.8	1	0.005	0.5
MD-S2	29-Apr-13	NON FILTERED ELUTRIATE	Thallium (Total)	<0.005	ug/L	U	EPA 200.8	1	0.005	0.5
MD-S1	29-Apr-13	PRE ELUTRIATE	Thallium (Total)	6.2	ug/L		EPA 200.8	1	0.005	0.5
MD-S2	29-Apr-13	PRE ELUTRIATE	Thallium (Total)	2.3	ug/L		EPA 200.8	1	0.005	0.5
MD-W1	29-Apr-13	RECEIVING WATER	Thallium (Total)	<0.005	ug/L	U	EPA 200.8	1	0.005	0.5
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	Total Kjeldahl Nitrogen	1.69	mg/L		PAI-DK 02	1	0.08	0.5
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	Total Kjeldahl Nitrogen	0.54	mg/L		PAI-DK 02	1	0.08	0.5
MD-S1	29-Apr-13	PRE ELUTRIATE	Total Kjeldahl Nitrogen	23.1	mg/L		PAI-DK 02	5	0.42	2.5
MD-S2A	29-Apr-13	PRE ELUTRIATE	Total Kjeldahl Nitrogen	6.52	mg/L		PAI-DK 02	2	0.17	1
MD-W1	29-Apr-13	RECEIVING WATER	Total Kjeldahl Nitrogen	0.42	mg/L	J	PAI-DK 02	1	0.08	0.5
MD-S1	26-Apr-13	SEDIMENT	Total Kjeldahl Nitrogen	180	mg/kg dry		PAI-DK 01	25	7.4	13.5
MD-S2A	26-Apr-13	SEDIMENT	Total Kjeldahl Nitrogen	100	mg/kg dry		PAI-DK 01	20	5.8	10.6
MD-S2B	26-Apr-13	SEDIMENT	Total Kjeldahl Nitrogen	82.2	mg/kg dry		PAI-DK 01	20	5.8	10.5
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	Total Organic Carbon	8.6	mg/L		SM 5310 B-2000	1	0.3	1

Station	Date	SampleSource	Analyte	Result	Units	Qual	Method	DF	MDL	MRL
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	Total Organic Carbon	7.2	mg/L		SM 5310 B-2000	1	0.3	1
MD-S1	29-Apr-13	PRE ELUTRIATE	Total Organic Carbon	347	mg/L		SM 5310 B-2000	1	0.3	1
MD-S2A	29-Apr-13	PRE ELUTRIATE	Total Organic Carbon	149	mg/L		SM 5310 B-2000	1	0.3	1
MD-W1	29-Apr-13	RECEIVING WATER	Total Organic Carbon	4.8	mg/L		SM 5310 B-2000	1	0.3	1
MD-S1	26-Apr-13	SEDIMENT	Total Organic Carbon	0.52	% dry		ASTM D5373-08(mod)	1	0.01	0.01
MD-S2A	26-Apr-13	SEDIMENT	Total Organic Carbon	0.2	% dry		ASTM D5373-08(mod)	1	0.01	0.01
MD-S2B	26-Apr-13	SEDIMENT	Total Organic Carbon	0.14	% dry		ASTM D5373-08(mod)	1	0.01	0.01
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	Total Suspended Solids	267	mg/L		SM 2540 D-1997	1	4	4
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	Total Suspended Solids	189	mg/L		SM 2540 D-1997	1	4	4
MD-S1	29-Apr-13	PRE ELUTRIATE	Total Suspended Solids	21900	mg/L		SM 2540 D-1997	1	4	4
MD-S2A	29-Apr-13	PRE ELUTRIATE	Total Suspended Solids	6230	mg/L		SM 2540 D-1997	1	4	4
MD-W1	29-Apr-13	RECEIVING WATER	Total Suspended Solids	67	mg/L		SM 2540 D-1997	1	4	4
MD-S1	29-Apr-13	FILTERED ELUTRIATE	Turbidity	0.105	NTU		EPA 180.1	5	0.05	0.05
MD-S2A	29-Apr-13	FILTERED ELUTRIATE	Turbidity	0.119	NTU		EPA 180.1	5	0.05	0.05
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	Turbidity	381	NTU		EPA 180.1	1	0.01	0.01
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	Turbidity	292	NTU		EPA 180.1	1	0.01	0.01
MD-S1	29-Apr-13	PRE ELUTRIATE	Turbidity	6750	NTU		EPA 180.1	50000	500	500
MD-S2A	29-Apr-13	PRE ELUTRIATE	Turbidity	2850	NTU		EPA 180.1	25000	250	250
MD-W1	29-Apr-13	RECEIVING WATER	Turbidity	29.8	NTU		EPA 180.1	100	1	1
MD-S1	29-Apr-13	FILTERED ELUTRIATE	Zinc (Dissolved)	0.01	mg/L	J	EPA 200.7	2	0.004	0.02
MD-S2A	29-Apr-13	FILTERED ELUTRIATE	Zinc (Dissolved)	0.008	mg/L	J	EPA 200.7	2	0.004	0.02
MD-W1	29-Apr-13	RECEIVING WATER	Zinc (Dissolved)	0.01	mg/L	J	EPA 200.7	2	0.004	0.02
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	Zinc (Total)	0.08	mg/L		EPA 200.7	2	0.004	0.02
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	Zinc (Total)	0.08	mg/L		EPA 200.7	2	0.004	0.02
MD-S1	29-Apr-13	PRE ELUTRIATE	Zinc (Total)	1.55	mg/L		EPA 200.7	2	0.004	0.02
MD-S2A	29-Apr-13	PRE ELUTRIATE	Zinc (Total)	0.69	mg/L		EPA 200.7	2	0.004	0.02
MD-W1	29-Apr-13	RECEIVING WATER	Zinc (Total)	0.02	mg/L	J	EPA 200.7	2	0.004	0.02
MD-S1	26-Apr-13	SEDIMENT	Zinc (Total)	26.7	mg/kg dry		EPA 6010B	53.65	0.2	0.6
MD-S2A	26-Apr-13	SEDIMENT	Zinc (Total)	20.1	mg/kg dry		EPA 6010B	51.28	0.2	0.5
MD-S2B	26-Apr-13	SEDIMENT	Zinc (Total)	20	mg/kg dry		EPA 6010B	53.33	0.2	0.6
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	4,4'-DDD	<0.004	ug/L	U	EPA 8081	5	0.004	0.1
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	4,4'-DDD	<0.004	ug/L	U	EPA 8081	5	0.004	0.1
MD-W1	29-Apr-13	RECEIVING WATER	4,4'-DDD	<0.004	ug/L	U	EPA 8081	5	0.004	0.1
MD-S1	26-Apr-13	SEDIMENT	4,4'-DDD	<1	ug/kg	U	EPA 8081	500	1	10
MD-S2A	26-Apr-13	SEDIMENT	4,4'-DDD	<1	ug/kg	U	EPA 8081	500	1	10
MD-S2B	26-Apr-13	SEDIMENT	4,4'-DDD	<1	ug/kg	U	EPA 8081	500	1	10
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	4,4'-DDE	<0.004	ug/L	U	EPA 8081	5	0.004	0.1
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	4,4'-DDE	<0.004	ug/L	U	EPA 8081	5	0.004	0.1
MD-W1	29-Apr-13	RECEIVING WATER	4,4'-DDE	<0.004	ug/L	U	EPA 8081	5	0.004	0.1
MD-S1	26-Apr-13	SEDIMENT	4,4'-DDE	<1	ug/kg	U	EPA 8081	500	1	10
MD-S2A	26-Apr-13	SEDIMENT	4,4'-DDE	<1	ug/kg	U	EPA 8081	500	1	10
MD-S2B	26-Apr-13	SEDIMENT	4,4'-DDE	<1	ug/kg	U	EPA 8081	500	1	10
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	4,4'-DDT	<0.003	ug/L	U	EPA 8081	5	0.003	0.1
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	4,4'-DDT	<0.003	ug/L	U	EPA 8081	5	0.003	0.1
MD-W1	29-Apr-13	RECEIVING WATER	4,4'-DDT	<0.003	ug/L	U	EPA 8081	5	0.003	0.1

Station	Date	SampleSource	Analyte	Result	Units	Qual	Method	DF	MDL	MRL
MD-S1	26-Apr-13	SEDIMENT	4,4'-DDT	<3	ug/kg	U	EPA 8081	500	3	10
MD-S2A	26-Apr-13	SEDIMENT	4,4'-DDT	<3	ug/kg	U	EPA 8081	500	3	10
MD-S2B	26-Apr-13	SEDIMENT	4,4'-DDT	<3	ug/kg	U	EPA 8081	500	3	10
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	Aldrin	<0.006	ug/L	U	EPA 8081	5	0.006	0.5
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	Aldrin	<0.006	ug/L	U	EPA 8081	5	0.006	0.5
MD-W1	29-Apr-13	RECEIVING WATER	Aldrin	<0.006	ug/L	U	EPA 8081	5	0.006	0.5
MD-S1	26-Apr-13	SEDIMENT	Aldrin	<1	ug/kg	U	EPA 8081	500	1	5
MD-S2A	26-Apr-13	SEDIMENT	Aldrin	<1	ug/kg	U	EPA 8081	500	1	5
MD-S2B	26-Apr-13	SEDIMENT	Aldrin	<1	ug/kg	U	EPA 8081	500	1	5
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	alpha-BHC	<0.004	ug/L	U	EPA 8081	5	0.004	0.05
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	alpha-BHC	<0.004	ug/L	U	EPA 8081	5	0.004	0.05
MD-W1	29-Apr-13	RECEIVING WATER	alpha-BHC	<0.004	ug/L	U	EPA 8081	5	0.004	0.05
MD-S1	26-Apr-13	SEDIMENT	alpha-BHC	<1	ug/kg	U	EPA 8081	500	1	5
MD-S2A	26-Apr-13	SEDIMENT	alpha-BHC	<1	ug/kg	U	EPA 8081	500	1	5
MD-S2B	26-Apr-13	SEDIMENT	alpha-BHC	<1	ug/kg	U	EPA 8081	500	1	5
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	alpha-Chlordane	<0.004	ug/L	U	EPA 8081	5	0.004	0.05
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	alpha-Chlordane	<0.004	ug/L	U	EPA 8081	5	0.004	0.05
MD-W1	29-Apr-13	RECEIVING WATER	alpha-Chlordane	<0.004	ug/L	U	EPA 8081	5	0.004	0.05
MD-S1	26-Apr-13	SEDIMENT	alpha-Chlordane	<1	ug/kg	U	EPA 8081	500	1	5
MD-S2A	26-Apr-13	SEDIMENT	alpha-Chlordane	<1	ug/kg	U	EPA 8081	500	1	5
MD-S2B	26-Apr-13	SEDIMENT	alpha-Chlordane	<1	ug/kg	U	EPA 8081	500	1	5
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	beta-BHC	<0.003	ug/L	U	EPA 8081	5	0.003	0.05
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	beta-BHC	<0.003	ug/L	U	EPA 8081	5	0.003	0.05
MD-W1	29-Apr-13	RECEIVING WATER	beta-BHC	<0.003	ug/L	U	EPA 8081	5	0.003	0.05
MD-S1	26-Apr-13	SEDIMENT	beta-BHC	<5	ug/kg	U	EPA 8081	500	5	5
MD-S2A	26-Apr-13	SEDIMENT	beta-BHC	<5	ug/kg	U	EPA 8081	500	5	5
MD-S2B	26-Apr-13	SEDIMENT	beta-BHC	<5	ug/kg	U	EPA 8081	500	5	5
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	delta-BHC	<0.02	ug/L	U	EPA 8081	5	0.02	0.05
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	delta-BHC	<0.02	ug/L	U	EPA 8081	5	0.02	0.05
MD-W1	29-Apr-13	RECEIVING WATER	delta-BHC	<0.02	ug/L	U	EPA 8081	5	0.02	0.05
MD-S1	26-Apr-13	SEDIMENT	delta-BHC	<1	ug/kg	U	EPA 8081	500	1	5
MD-S2A	26-Apr-13	SEDIMENT	delta-BHC	<1	ug/kg	U	EPA 8081	500	1	5
MD-S2B	26-Apr-13	SEDIMENT	delta-BHC	<1	ug/kg	U	EPA 8081	500	1	5
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	Dieldrin	<0.004	ug/L	U	EPA 8081	5	0.004	0.1
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	Dieldrin	<0.004	ug/L	U	EPA 8081	5	0.004	0.1
MD-W1	29-Apr-13	RECEIVING WATER	Dieldrin	<0.004	ug/L	U	EPA 8081	5	0.004	0.1
MD-S1	26-Apr-13	SEDIMENT	Dieldrin	<1	ug/kg	U	EPA 8081	500	1	10
MD-S2A	26-Apr-13	SEDIMENT	Dieldrin	<1	ug/kg	U	EPA 8081	500	1	10
MD-S2B	26-Apr-13	SEDIMENT	Dieldrin	<1	ug/kg	U	EPA 8081	500	1	10
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	Endosulfan I	<0.004	ug/L	U	EPA 8081	5	0.004	0.05
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	Endosulfan I	<0.004	ug/L	U	EPA 8081	5	0.004	0.05
MD-W1	29-Apr-13	RECEIVING WATER	Endosulfan I	<0.004	ug/L	U	EPA 8081	5	0.004	0.05
MD-S1	26-Apr-13	SEDIMENT	Endosulfan I	<1	ug/kg	U	EPA 8081	500	1	5
MD-S2A	26-Apr-13	SEDIMENT	Endosulfan I	<1	ug/kg	U	EPA 8081	500	1	5
MD-S2B	26-Apr-13	SEDIMENT	Endosulfan I	<1	ug/kg	U	EPA 8081	500	1	5

Station	Date	SampleSource	Analyte	Result	Units	Qual	Method	DF	MDL	MRL
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	Endosulfan II	<0.003	ug/L	U	EPA 8081	5	0.003	0.1
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	Endosulfan II	<0.003	ug/L	U	EPA 8081	5	0.003	0.1
MD-W1	29-Apr-13	RECEIVING WATER	Endosulfan II	<0.003	ug/L	U	EPA 8081	5	0.003	0.1
MD-S1	26-Apr-13	SEDIMENT	Endosulfan II	<1	ug/kg	U	EPA 8081	500	1	10
MD-S2A	26-Apr-13	SEDIMENT	Endosulfan II	<1	ug/kg	U	EPA 8081	500	1	10
MD-S2B	26-Apr-13	SEDIMENT	Endosulfan II	<1	ug/kg	U	EPA 8081	500	1	10
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	Endosulfan sulfate	<0.004	ug/L	U	EPA 8081	5	0.004	0.1
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	Endosulfan sulfate	<0.004	ug/L	U	EPA 8081	5	0.004	0.1
MD-W1	29-Apr-13	RECEIVING WATER	Endosulfan sulfate	<0.004	ug/L	U	EPA 8081	5	0.004	0.1
MD-S1	26-Apr-13	SEDIMENT	Endosulfan sulfate	<1	ug/kg	U	EPA 8081	500	1	10
MD-S2A	26-Apr-13	SEDIMENT	Endosulfan sulfate	<1	ug/kg	U	EPA 8081	500	1	10
MD-S2B	26-Apr-13	SEDIMENT	Endosulfan sulfate	<1	ug/kg	U	EPA 8081	500	1	10
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	Endrin	<0.004	ug/L	U	EPA 8081	5	0.004	0.1
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	Endrin	<0.004	ug/L	U	EPA 8081	5	0.004	0.1
MD-W1	29-Apr-13	RECEIVING WATER	Endrin	<0.004	ug/L	U	EPA 8081	5	0.004	0.1
MD-S1	26-Apr-13	SEDIMENT	Endrin	<2	ug/kg	U	EPA 8081	500	2	10
MD-S2A	26-Apr-13	SEDIMENT	Endrin	<2	ug/kg	U	EPA 8081	500	2	10
MD-S2B	26-Apr-13	SEDIMENT	Endrin	<2	ug/kg	U	EPA 8081	500	2	10
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	Endrin aldehyde	<0.004	ug/L	U	EPA 8081	5	0.004	0.1
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	Endrin aldehyde	<0.004	ug/L	U	EPA 8081	5	0.004	0.1
MD-W1	29-Apr-13	RECEIVING WATER	Endrin aldehyde	<0.004	ug/L	U	EPA 8081	5	0.004	0.1
MD-S1	26-Apr-13	SEDIMENT	Endrin aldehyde	<3	ug/kg	U	EPA 8081	500	3	10
MD-S2A	26-Apr-13	SEDIMENT	Endrin aldehyde	<3	ug/kg	U	EPA 8081	500	3	10
MD-S2B	26-Apr-13	SEDIMENT	Endrin aldehyde	<3	ug/kg	U	EPA 8081	500	3	10
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	Endrin ketone	<0.003	ug/L	U	EPA 8081	5	0.003	0.1
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	Endrin ketone	<0.003	ug/L	U	EPA 8081	5	0.003	0.1
MD-W1	29-Apr-13	RECEIVING WATER	Endrin ketone	<0.003	ug/L	U	EPA 8081	5	0.003	0.1
MD-S1	26-Apr-13	SEDIMENT	Endrin ketone	<1	ug/kg	U	EPA 8081	500	1	10
MD-S2A	26-Apr-13	SEDIMENT	Endrin ketone	<1	ug/kg	U	EPA 8081	500	1	10
MD-S2B	26-Apr-13	SEDIMENT	Endrin ketone	<1	ug/kg	U	EPA 8081	500	1	10
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	gamma-BHC (Lindane)	<0.004	ug/L	U	EPA 8081	5	0.004	0.05
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	gamma-BHC (Lindane)	<0.004	ug/L	U	EPA 8081	5	0.004	0.05
MD-W1	29-Apr-13	RECEIVING WATER	gamma-BHC (Lindane)	<0.004	ug/L	U	EPA 8081	5	0.004	0.05
MD-S1	26-Apr-13	SEDIMENT	gamma-BHC (Lindane)	<2	ug/kg	U	EPA 8081	500	2	5
MD-S2A	26-Apr-13	SEDIMENT	gamma-BHC (Lindane)	<2	ug/kg	U	EPA 8081	500	2	5
MD-S2B	26-Apr-13	SEDIMENT	gamma-BHC (Lindane)	<2	ug/kg	U	EPA 8081	500	2	5
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	gamma-Chlordane	<0.005	ug/L	U	EPA 8081	5	0.005	0.05
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	gamma-Chlordane	<0.005	ug/L	U	EPA 8081	5	0.005	0.05
MD-W1	29-Apr-13	RECEIVING WATER	gamma-Chlordane	<0.005	ug/L	U	EPA 8081	5	0.005	0.05
MD-S1	26-Apr-13	SEDIMENT	gamma-Chlordane	<1	ug/kg	U	EPA 8081	500	1	5
MD-S2A	26-Apr-13	SEDIMENT	gamma-Chlordane	<1	ug/kg	U	EPA 8081	500	1	5
MD-S2B	26-Apr-13	SEDIMENT	gamma-Chlordane	<1	ug/kg	U	EPA 8081	500	1	5
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	Heptachlor	<0.005	ug/L	U	EPA 8081	5	0.005	0.05
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	Heptachlor	<0.005	ug/L	U	EPA 8081	5	0.005	0.05
MD-W1	29-Apr-13	RECEIVING WATER	Heptachlor	<0.005	ug/L	U	EPA 8081	5	0.005	0.05

Station	Date	SampleSource	Analyte	Result	Units	Qual	Method	DF	MDL	MRL
MD-S1	26-Apr-13	SEDIMENT	Heptachlor	<2	ug/kg	U	EPA 8081	500	2	5
MD-S2A	26-Apr-13	SEDIMENT	Heptachlor	<2	ug/kg	U	EPA 8081	500	2	5
MD-S2B	26-Apr-13	SEDIMENT	Heptachlor	<2	ug/kg	U	EPA 8081	500	2	5
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	Heptachlor Epoxide	<0.004	ug/L	U	EPA 8081	5	0.004	0.05
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	Heptachlor Epoxide	<0.004	ug/L	U	EPA 8081	5	0.004	0.05
MD-W1	29-Apr-13	RECEIVING WATER	Heptachlor Epoxide	<0.004	ug/L	U	EPA 8081	5	0.004	0.05
MD-S1	26-Apr-13	SEDIMENT	Heptachlor Epoxide	<1	ug/kg	U	EPA 8081	500	1	5
MD-S2A	26-Apr-13	SEDIMENT	Heptachlor Epoxide	<1	ug/kg	U	EPA 8081	500	1	5
MD-S2B	26-Apr-13	SEDIMENT	Heptachlor Epoxide	<1	ug/kg	U	EPA 8081	500	1	5
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	Methoxychlor	<0.004	ug/L	U	EPA 8081	5	0.004	0.5
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	Methoxychlor	<0.004	ug/L	U	EPA 8081	5	0.004	0.5
MD-W1	29-Apr-13	RECEIVING WATER	Methoxychlor	<0.004	ug/L	U	EPA 8081	5	0.004	0.5
MD-S1	26-Apr-13	SEDIMENT	Methoxychlor	<2	ug/kg	U	EPA 8081	500	2	50
MD-S2A	26-Apr-13	SEDIMENT	Methoxychlor	<2	ug/kg	U	EPA 8081	500	2	50
MD-S2B	26-Apr-13	SEDIMENT	Methoxychlor	<2	ug/kg	U	EPA 8081	500	2	50
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	Toxaphene	<0.1	ug/L	U	EPA 8081	5	0.1	5
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	Toxaphene	<0.1	ug/L	U	EPA 8081	5	0.1	5
MD-W1	29-Apr-13	RECEIVING WATER	Toxaphene	<0.1	ug/L	U	EPA 8081	5	0.1	5
MD-S1	26-Apr-13	SEDIMENT	Toxaphene	<273	ug/kg	U	EPA 8081	500	273	450
MD-S2A	26-Apr-13	SEDIMENT	Toxaphene	<273	ug/kg	U	EPA 8081	500	273	450
MD-S2B	26-Apr-13	SEDIMENT	Toxaphene	<273	ug/kg	U	EPA 8081	500	273	450
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	Aroclor-1016	<0.7	ug/L	U	EPA 8082	5	0.7	1
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	Aroclor-1016	<0.7	ug/L	U	EPA 8082	5	0.7	1
MD-W1	29-Apr-13	RECEIVING WATER	Aroclor-1016	<0.7	ug/L	U	EPA 8082	5	0.7	1
MD-S1	26-Apr-13	SEDIMENT	Aroclor-1016	<54	ug/kg	U	EPA 8082	500	54	100
MD-S2A	26-Apr-13	SEDIMENT	Aroclor-1016	<54	ug/kg	U	EPA 8082	500	54	100
MD-S2B	26-Apr-13	SEDIMENT	Aroclor-1016	<54	ug/kg	U	EPA 8082	500	54	100
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	Aroclor-1221	<0.7	ug/L	U	EPA 8082	5	0.7	1
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	Aroclor-1221	<0.7	ug/L	U	EPA 8082	5	0.7	1
MD-W1	29-Apr-13	RECEIVING WATER	Aroclor-1221	<0.7	ug/L	U	EPA 8082	5	0.7	1
MD-S1	26-Apr-13	SEDIMENT	Aroclor-1221	<54	ug/kg	U	EPA 8082	500	54	100
MD-S2A	26-Apr-13	SEDIMENT	Aroclor-1221	<54	ug/kg	U	EPA 8082	500	54	100
MD-S2B	26-Apr-13	SEDIMENT	Aroclor-1221	<54	ug/kg	U	EPA 8082	500	54	100
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	Aroclor-1232	<0.7	ug/L	U	EPA 8082	5	0.7	1
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	Aroclor-1232	<0.7	ug/L	U	EPA 8082	5	0.7	1
MD-W1	29-Apr-13	RECEIVING WATER	Aroclor-1232	<0.7	ug/L	U	EPA 8082	5	0.7	1
MD-S1	26-Apr-13	SEDIMENT	Aroclor-1232	<54	ug/kg	U	EPA 8082	500	54	100
MD-S2A	26-Apr-13	SEDIMENT	Aroclor-1232	<54	ug/kg	U	EPA 8082	500	54	100
MD-S2B	26-Apr-13	SEDIMENT	Aroclor-1232	<54	ug/kg	U	EPA 8082	500	54	100
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	Aroclor-1242	<0.7	ug/L	U	EPA 8082	5	0.7	1
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	Aroclor-1242	<0.7	ug/L	U	EPA 8082	5	0.7	1
MD-W1	29-Apr-13	RECEIVING WATER	Aroclor-1242	<0.7	ug/L	U	EPA 8082	5	0.7	1
MD-S1	26-Apr-13	SEDIMENT	Aroclor-1242	<54	ug/kg	U	EPA 8082	500	54	100
MD-S2A	26-Apr-13	SEDIMENT	Aroclor-1242	<54	ug/kg	U	EPA 8082	500	54	100
MD-S2B	26-Apr-13	SEDIMENT	Aroclor-1242	<54	ug/kg	U	EPA 8082	500	54	100

Station	Date	SampleSource	Analyte	Result	Units	Qual	Method	DF	MDL	MRL
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	Aroclor-1248	<0.7	ug/L	U	EPA 8082	5	0.7	1
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	Aroclor-1248	<0.7	ug/L	U	EPA 8082	5	0.7	1
MD-W1	29-Apr-13	RECEIVING WATER	Aroclor-1248	<0.7	ug/L	U	EPA 8082	5	0.7	1
MD-S1	26-Apr-13	SEDIMENT	Aroclor-1248	<54	ug/kg	U	EPA 8082	500	54	100
MD-S2A	26-Apr-13	SEDIMENT	Aroclor-1248	<54	ug/kg	U	EPA 8082	500	54	100
MD-S2B	26-Apr-13	SEDIMENT	Aroclor-1248	<54	ug/kg	U	EPA 8082	500	54	100
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	Aroclor-1254	<0.7	ug/L	U	EPA 8082	5	0.7	1
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	Aroclor-1254	<0.7	ug/L	U	EPA 8082	5	0.7	1
MD-W1	29-Apr-13	RECEIVING WATER	Aroclor-1254	<0.7	ug/L	U	EPA 8082	5	0.7	1
MD-S1	26-Apr-13	SEDIMENT	Aroclor-1254	<54	ug/kg	U	EPA 8082	500	54	100
MD-S2A	26-Apr-13	SEDIMENT	Aroclor-1254	<54	ug/kg	U	EPA 8082	500	54	100
MD-S2B	26-Apr-13	SEDIMENT	Aroclor-1254	<54	ug/kg	U	EPA 8082	500	54	100
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	Aroclor-1260	<0.7	ug/L	U	EPA 8082	5	0.7	1
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	Aroclor-1260	<0.7	ug/L	U	EPA 8082	5	0.7	1
MD-W1	29-Apr-13	RECEIVING WATER	Aroclor-1260	<0.7	ug/L	U	EPA 8082	5	0.7	1
MD-S1	26-Apr-13	SEDIMENT	Aroclor-1260	<54	ug/kg	U	EPA 8082	500	54	100
MD-S2A	26-Apr-13	SEDIMENT	Aroclor-1260	<54	ug/kg	U	EPA 8082	500	54	100
MD-S2B	26-Apr-13	SEDIMENT	Aroclor-1260	<54	ug/kg	U	EPA 8082	500	54	100
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	Aroclor-1262	<0.7	ug/L	U	EPA 8082	5	0.7	1
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	Aroclor-1262	<0.7	ug/L	U	EPA 8082	5	0.7	1
MD-W1	29-Apr-13	RECEIVING WATER	Aroclor-1262	<0.7	ug/L	U	EPA 8082	5	0.7	1
MD-S1	26-Apr-13	SEDIMENT	Aroclor-1262	<54	ug/kg	U	EPA 8082	500	54	100
MD-S2A	26-Apr-13	SEDIMENT	Aroclor-1262	<54	ug/kg	U	EPA 8082	500	54	100
MD-S2B	26-Apr-13	SEDIMENT	Aroclor-1262	<54	ug/kg	U	EPA 8082	500	54	100
MD-S1	29-Apr-13	NON FILTERED ELUTRIATE	Aroclor-1268	<0.7	ug/L	U	EPA 8082	5	0.7	1
MD-S2A	29-Apr-13	NON FILTERED ELUTRIATE	Aroclor-1268	<0.7	ug/L	U	EPA 8082	5	0.7	1
MD-W1	29-Apr-13	RECEIVING WATER	Aroclor-1268	<0.7	ug/L	U	EPA 8082	5	0.7	1
MD-S1	26-Apr-13	SEDIMENT	Aroclor-1268	<54	ug/kg	U	EPA 8082	500	54	100
MD-S2A	26-Apr-13	SEDIMENT	Aroclor-1268	<54	ug/kg	U	EPA 8082	500	54	100
MD-S2B	26-Apr-13	SEDIMENT	Aroclor-1268	<54	ug/kg	U	EPA 8082	500	54	100